Siting Board 1-1:

Submit a copy of the leases or purchase agreements, including options, separate agreements, or deeds which Barrelhead Solar has entered into in connection with the proposed solar facility, including the agreements for each of the parcels of the Project.

Response: See SAR, Appendix D.

Witness: Marty Marchaterre

Siting Board 1-2:

Detail any contracts by which Barrelhead Solar has paid, has negotiated to pay, or any compensation paid to non-participating landowners, whether cash or otherwise, near the Project. Include the terms of the agreements and which properties are involved, in terms of distance, to the project boundaries.

Response: Barrelhead Solar has not paid or negotiated to pay any compensation to non-participating landowners.

Witness: Trudie Grattan

Siting Board 1-3:

Explain what portion, if any, of the Project site is located in Clinton County.

Response: The Project is not located in Clinton County.

Witness: Marty Marchaterre

Siting Board 1-4:

If any portion of the Project site is located within Clinton County, state whether Clinton County has enacted any setback requirements, noise ordinances, or other regulations applicable to the Project.

Response: Not Applicable. See response to RFI 1-3.

Witness: Marty Marchaterre

Siting Board 1-5:

Provide the total number of months or years of construction. Explain any potential for deviation to that schedule.

Response: Barrelhead Solar anticipates that the Project construction will take 8 to 12 months to complete. Inclement weather conditions or equipment/material shipping delays have the potential to cause schedule deviations.

Witness: Trudie Grattan

Siting Board 1-6:

Refer to the Site Assessment Report (SAR), Appendix B, Preliminary Site Layout.

Explain each of the Bertram Exclusion Areas identified on the map.

Response: The Bertram Exclusion Areas identified on the map are areas outlined in the Lease Agreement that the landowner plans to retain for their use (See SAR, Appendix D). Barrelhead Solar is not leasing these areas. These Exclusion Areas consist of residential buildings as well as a barn on the southern end of the property being used by the landowner.

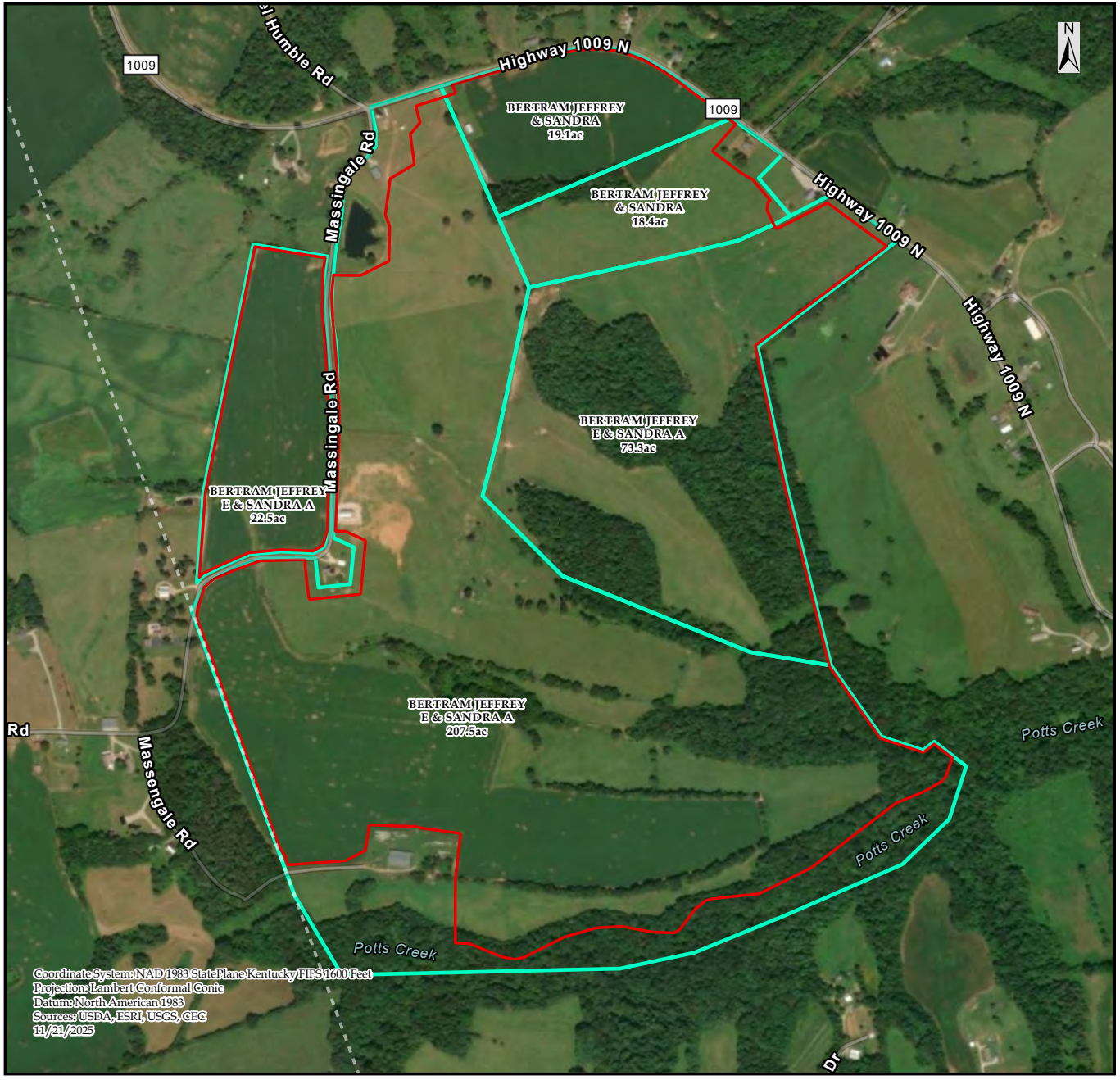
Witness: Trudie Grattan

Siting Board 1-7:

Provide a parcel map, identifying individual parcels within the Project boundary, owner name, and acreage.

Response: A parcel map showing the five individual parcels that comprise the Project Area is provided as Attachment 1-7. The parcels are all owned by Jeffrey and Sandra Bertram.

Witness: Marty Marchaterre



COPPERHEAD
ENVIRONMENTAL CONSULTING

Prepared for:

Barrelhead Solar, LLC

FIGURE 1-7:
Parcel Map for the
Barrelhead Solar Project,
Wayne County, Kentucky.

Legend

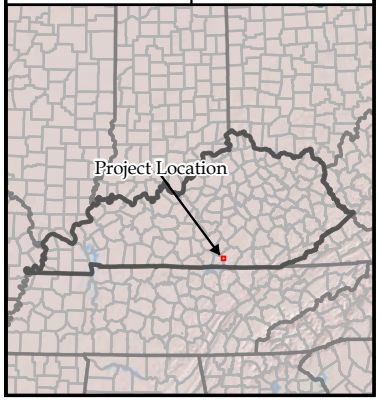
- Parcel Boundary
- Project Boundary

0 750 1,500
US Feet

Scale: 1 in = 750 ft

Prepared by :
Copperhead Environmental Consulting, Inc.
471 Main Street
P.O. Box 73
Paint Lick, Kentucky 40461

Drawn by:	TC	Date:	11/21/2025
Checked by:	KR	Revision:	03



Siting Board 1-8:

Explain how Barrelhead Solar plans to mitigate arrivals and departures to minimize disruption to the area.

Response: Construction activity will be limited to the hours of 7 a.m. to 7 p.m., Monday through Saturday, over a period of approximately 8 to 12 months. Select non-noise causing activity and non-construction work may be required during night hours when equipment is not energized. Construction activities that create a higher level of noise, such as pile driving, will be limited to 8 a.m. to 5 p.m., Monday through Friday. Non-noise-causing and non-construction activities can take place between 6 a.m. to 10 p.m., Monday through Sunday, including field visits, arrival, departure, planning, meetings, mowing, surveying, etc.

Routine operation and maintenance activities will take place on fewer than half of the days of the year and may take place during typical daytime hours, from 8 a.m. to 5 p.m., Monday through Friday. Non-noise-causing maintenance may be carried out during nighttime hours for up to 50 days per year.

Barrelhead Solar will implement ridesharing between construction workers when feasible, use appropriate traffic controls, or allow flexible working hours outside of peak hours to minimize potential traffic delays during A.M. and P.M. peak hours.

Witness: Marty Marchaterre

Siting Board 1-9:

Explain whether the construction and operational entrances will be locked outside of normal working hours.

Response: Barrelhead Solar and the Engineering, Procurement, and Construction (EPC) contractor will be responsible for controlling access to the Project Area during construction. Barrelhead Solar will be responsible for controlling access to the Project Area during operations. Access to the Project will be controlled by locked gates outside of working hours.

Witness: Marty Marchaterre

Siting Board 1-10:

Provide a schedule for the project, starting from the receipt of the proposed certificate for construction to the completion of the project, including the length of each construction phase. Include when the peak construction would occur within the timeline.

Response: The table below outlines a tentative schedule for the Project. Once the EPC contractor is selected, a more detailed timeline will be developed.

Task	Estimated Duration	Anticipated Timeframe
Construction Certificate Application	180 days	October 3, 2025 – April 1, 2026
EPC Selection	300 days	February – November 2027
Final Engineering	330 days	February – December 2027
Site preparation	60 days	February – March 2028
Pile Installation*	150 days	April – August 2028
Racking Installation*	150 days	May – September 2028
Module Installation*	170 days	June – November 2028
Project Substation	150 days	June – October 2028
Transmission Line	30 days	November 2028
Mechanical Completion	60 days	January – February 2028
Commissioning	150 days	February 2029

*Denotes peak construction

Witness: Trudie Grattan

Siting Board 1-11

Provide what time of day construction and operation and maintenance activities will begin and end each day.

Response: Generally, construction activities and deliveries including field visits, arrival, departure, planning, meetings, surveying, etc. will take place during daylight hours. Construction activity would be limited to the hours of 7 a.m. to 7 p.m., Monday through Saturday, over a period of approximately 8 to 12 months. Select non-noise causing activity and non-construction work may be required during night hours when equipment is not energized. Construction activities that create a higher level of noise, such as pile driving, will be limited to 8 a.m. to 5 p.m., Monday through Friday. Non-noise-causing and non-construction activities can take place between 6 a.m. to 10 p.m., Monday through Sunday, including field visits, arrival, departure, planning, meetings, mowing, surveying, etc.

Routine operation and maintenance activities would take place on fewer than half of the days of the year and may take place during typical daytime hours, from 8 a.m. to 5 p.m., Monday through Friday. Non-noise-causing maintenance may be carried out during nighttime hours for up to 50 days per year.

Witness: Marty Marchaterre

Siting Board 1-12:

Provide a narrative description of the location of each laydown area to be used during construction.

Response: The main laydown area will be located next to the main entrance at the northern end of the Project Area and is expected to be approximately 1.31 acres. Another laydown area will be located at the southernmost entrance on Massingale Road and is expected to be approximately 1.49 acres. Once selected, it is anticipated that the EPC contractor will identify other laydown areas to be used during construction.

Witness: Marty Marchaterre

Siting Board 1-13:

Provide a narrative description of the location to each of the following site

a. Each construction entrance.

b. Each entrance to be used in operations.

c. Operation & Maintenance (O&M) area.

d. Each laydown area.

Response: Each of the four following entrances will be used for construction (a) and operations/maintenance (b):

- The **main entrance** will be located at the northern end of the Project Area, approximately 36.785591, -85.006939 on KY 1009. This entrance will be used for both construction and operation/maintenance of the Project.
- An entrance located at approximately 36.778723, -85.010777 on Massingale Road would be used to access the portion of the Project Area that is west of Massingale Road. This entrance will be used for both construction and operation/maintenance of the Project.
- An entrance directly across from the above entrance on Massingale Road, at approximately 36.778744, -85.010675, would be used to access the main area of the Project Area. The entrance will be used for both construction and operation/maintenance of the Project.
- A final entrance on Massingale Road, at approximately 36.776759, -85.013420, will be used to access the southernmost portions of the Project Area. The entrance will be used for both construction and operation/maintenance of the Project.

c. Barrelhead Solar does not anticipate including an O&M building as part of the Project.

d. The main laydown area will be located next to the main entrance at the northern end of the Project Area. It is expected to be approximately 1.31 acres. Another laydown area will be located

at the southernmost entrance on Massingale Road and is expected to be approximately 1.49 acres. Once selected, it is anticipated that the EPC contractor will identify other laydown areas to be used during construction.

Witness: Marty Marchaterre

Siting Board 1-14:

Provide a detailed table listing all residential structures located within 2,000 feet of the Project boundary line. For each structure, provide:

a. The distance to the boundary line.

b. The distance to the closest solar panel.

c. The distance to the nearest inverter.

d. The distance to the substation.

Response: The following table from SAR Appendix E includes distances for all non-participating residences within 2,000 feet of the Project Area. The two participating structures identified in RFI 1-46 have been added at the bottom (See Attachment 1-46 Revised Noise Analysis, Figure 3).

Receptor ID	Distance to Project Area Boundary (feet)	Distance to Nearest Array (feet)	Distance to Substation (feet)	Distance to Nearest Inverter (feet)
Non-Participating Structures				
R-01	1,689	1,750	4,793	2,458
R-02	414	502	4,088	930
R-03	168	252	3,851	744
R-04	98	205	3,646	908
R-05	95	182	3,723	542
R-06	814	940	4,178	1,274
R-07	470	534	3,140	1,099
R-08	309	372	2,952	840
R-09	190	277	3,570	986
R-10	257	353	3,280	1,086
R-11	593	750	3,549	1,493
R-12	1,087	1,192	3,438	1,893
R-13	1,258	1,384	3,199	2,020
R-14	307	442	2,044	758
R-15	78	214	1,854	529
R-16	1,668	2,032	3,623	2,701

R-17	182	293	1,630	739
R-18	951	1,068	2,383	1,407
R-19	998	1,431	3,214	2,172
R-20	1,403	1,456	2,683	1,664
R-21	1,517	1,981	3,902	2,740
R-22	608	664	1,757	761
R-23	701	741	1,780	898
R-24	547	592	1,616	842
R-25	1,855	2,245	4,175	2,969
R-26	954	1,131	2,430	1,434
R-27	1,380	1,546	3,011	1,913
R-28	1,005	1,170	2,421	1,480
R-29	1,629	1,796	3,211	2,148
R-30	1,340	1,506	2,745	1,815
R-31	1,490	1,676	2,994	1,987
R-32	1,315	1,480	2,685	1,792
R-33	960	1,145	1,812	1,789
R-34	1,297	1,465	2,627	1,779
R-35	1,300	1,476	2,562	1,789
R-36	1,209	1,437	2,435	1,803
R-37	1,540	1,706	2,894	2,019
R-38	1,876	2,050	3,414	2,386
R-39	1,810	1,992	3,255	2,295
R-40	1,284	1,478	2,348	1,994
R-41	1,345	1,562	2,522	1,991
R-42	1,478	1,708	2,706	2,050
R-43	1,516	1,718	2,603	2,205
R-44	1,562	1,757	2,607	2,264
R-45	1,623	1,811	2,620	2,339
R-46	1,569	1,785	2,454	2,396
R-47	1,926	2,151	3,126	2,518
R-48	1,905	2,090	2,754	2,740
R-49	1,912	2,108	2,935	2,609
R-50	1,959	2,170	3,074	2,614
R-51	1,946	2,209	2,906	2,728
R-52	2,011	2,248	2,983	2,756
NR-01	1,170	1,248	4,705	1,587
NR-02	1,984	2,082	4,771	2,819
NR-03	1,816	1,914	4,600	2,671
NR-04	75	208	3,357	525
NR-05	56	161	3,291	463

NR-06	1,905	2,086	3,343	2,389
Participating Structures				
475 Massingale Rd.	117	191	1041	459
1837 KY 1009	123	175	3410	475

Witness: Marty Marchaterre

Siting Board 1-15:

Provide a detailed table listing all non-residential structures located within 2,000 feet of the Project boundary line. For each structure, provide:

a. A description of any structure (barn, commercial building, warehouse, church, etc.).

b. The distance to the boundary line.

c. The distance to the closest solar panel.

d. The distance to the nearest inverter.

e. The distance to the substation.

Response: The following table from SAR Appendix E includes distances for all non-participating non-residential structures within 2,000 feet of the Project Area (See Attachment 1-46 Revised Noise Analysis, Figure 4):

Receptor ID	Structure Type	Distance to Project Area Boundary (feet)	Distance to Nearest Array (feet)	Distance to Substation (feet)	Distance to Nearest Inverter (feet)
NR-01	Cemetery	1,170	1,248	4,705	1,587
NR-02	Barn	1,984	2,082	4,771	2,819
NR-03	Barn	1,816	1,914	4,600	2,671
NR-04	Church	75	208	3,357	525
NR-05	Cemetery	56	161	3,291	463
NR-06	Post Office	1,905	2,086	3,343	2,389

Witness: Marty Marchaterre

Siting Board 1-16:

Provide a physical description of the Project transmission line, including number of poles and height of poles, as applicable.

Response: The Upchurch Tap – Wayne County 69 kV line section will be cut and looped into the new interconnection substation. The new transmission line loop-in facilities will be owned, operated, and maintained by EKPC. The tap from the existing transmission line into the new switching station will consist of (2) direct embed guyed steel 3-pole dead-end structures.

The new interconnection substation will be connected to the Project substation via a monopole outside the substation fence.

The exact location of each pole and the height of poles will be determined during further detailed design.

Witness: Trudie Grattan

Siting Board 1-17:

Refer to the SAR, Attachment E, System Impact Studies, Phase III Study Report. Explain the "Future Exits" marked on the Diagram of Interconnection Studies, and whether these future exits will impact the Project layout and/or path of transmission lines.

Response: The Conceptual One-Line Diagram of Interconnection Facilities was created by PJM and East Kentucky Power Cooperative. The Future Exits are lines that the utility has the option to build out of the Substation in the future. At this time, Barrelhead Solar does not anticipate these future exits impacting the Project layout or path of transmission lines.

Witness: Trudie Grattan

Siting Board 1-18:

Explain whether there will be any special construction activities or personnel required to connect the Project to the existing East Kentucky Power Company transmission line.

Response: East Kentucky Power Cooperative will construct the Massingale 69 kV Switch Station and the transmission line connecting the Massingale 69 kV Switch Station to the East Kentucky Power Cooperative transmission line.

Witness: Trudie Grattan

Siting Board 1-19:

Explain whether a permanent O&M building will be constructed within the Project boundary. If so, identify the anticipated location of the O&M building on the Preliminary Site Layout map and describe the physical characteristics of the building, i.e., footprint acreage, height.

Response: Barrelhead Solar does not anticipate including an O&M building as part of the Project.

Witness: Trudie Grattan

Siting Board 1-20:

State whether there will be any weather stations located within the Project site. If so, indicate where those stations will be located narratively and on a revised Preliminary Site Layout map.

Response: Barrelhead Solar is not planning on constructing a weather station within the Project Area.

Witness: Trudie Grattan

Siting Board 1-21

Refer to the SAR, Appendix B, Preliminary Site Layout. Provide the total number of site access entrances in use during the construction phase and provide a narrative description of each entrance location. Provide a revised Preliminary Site Layout map if any of these locations have changed.

Response: As described in RFI 1-13, each of the four following entrances will be used for construction:

- The **main entrance** will be located at the northern end of the Project Area, approximately 36.785591, -85.006939 on KY 1009. This entrance will be used for both construction and operation/maintenance of the Project.
- An entrance located at approximately 36.778723, -85.010777 on Massingale Road would be used to access the portion of the Project Area that is west of Massingale Road. This entrance will be used for both construction and operation/maintenance of the Project.
- An entrance directly across from the above entrance on Massingale Road, at approximately 36.778744, -85.010675, would be used to access the main area of the Project Area. The entrance will be used for both construction and operation/maintenance of the Project.
- A final entrance on Massingale Road, at approximately 36.776759, -85.013420, will be used to access the southernmost portions of the Project Area. The entrance will be used for both construction and operation/maintenance of the Project.

Witness: Marty Marchaterre

Siting Board 1-22:

Refer to the SAR, Appendix B, Preliminary Site Layout. Provide the total number of site access entrances in use during the operations phase and provide a narrative description of each entrance location. Provide a revised Preliminary Site Layout map if any of these locations have changed.

Response: As described in RFI 1-13 and RFI 1-21, each of the four following entrances will be used for operations/maintenance:

- The **main entrance** will be located at the northern end of the Project Area, approximately 36.785591, -85.006939 on KY 1009. This entrance will be used for both construction and operation/maintenance of the Project.
- An entrance located at approximately 36.778723, -85.010777 on Massingale Road would be used to access the portion of the Project Area that is west of Massingale Road. This entrance will be used for both construction and operation/maintenance of the Project.
- An entrance directly across from the above entrance on Massingale Road, at approximately 36.778744, -85.010675, would be used to access the main area of the Project Area. The entrance will be used for both construction and operation/maintenance of the Project.
- A final entrance on Massingale Road, at approximately 36.776759, -85.013420, will be used to access the southernmost portions of the Project Area. The entrance will be used for both construction and operation/maintenance of the Project.

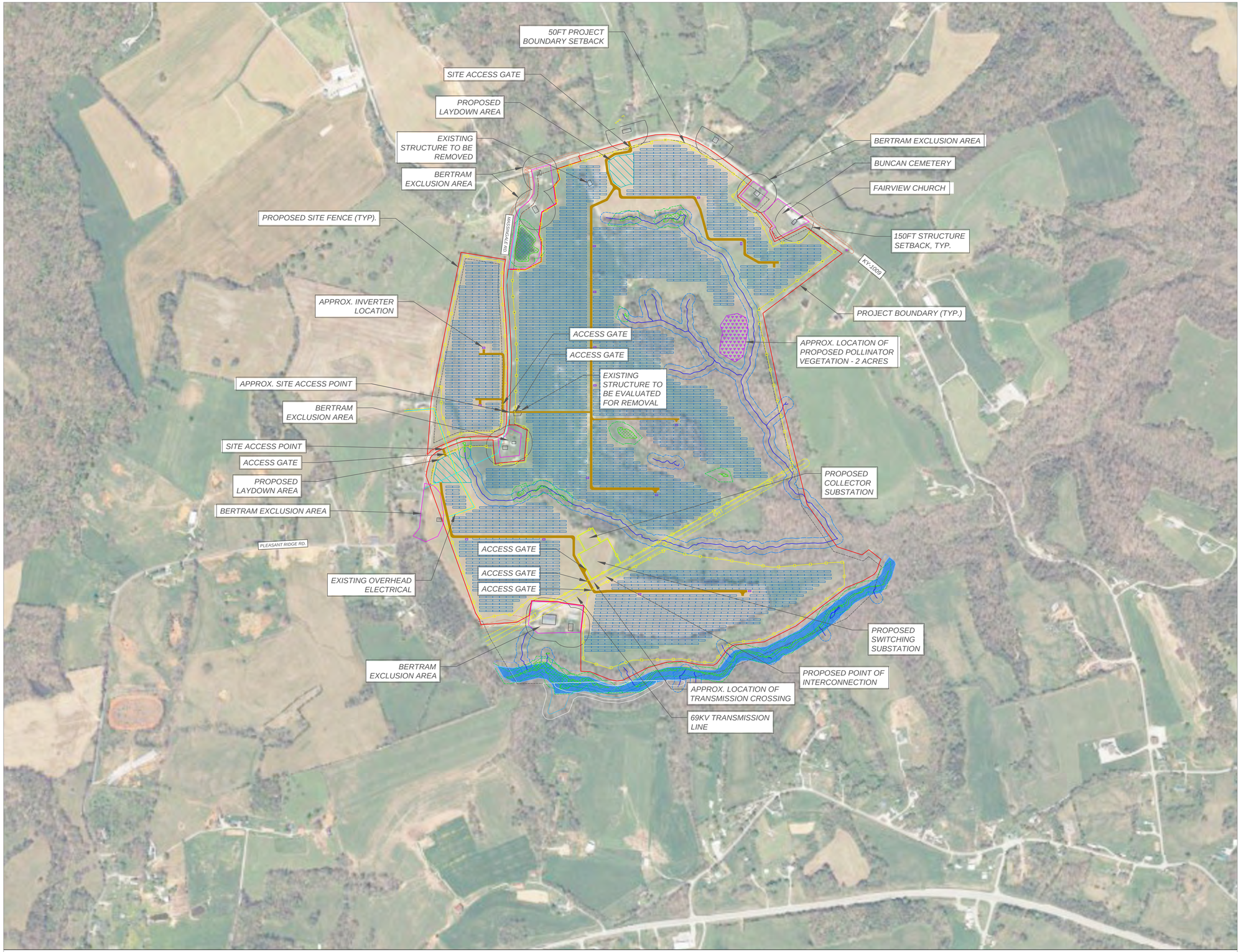
Witness: Marty Marchaterre

Siting Board 1-23:

Refer to the SAR, Appendix B, Preliminary Site Layout and Appendix I, Traffic Impact Study. State the total number of individually fenced parcels of solar arrays across the Project site. Provide a revised Preliminary Site Layout map if these fenced parcels have changed.

Response: Currently, Barrelhead Solar anticipates three individually fenced parcels of solar arrays across the Project site. A revised Preliminary Site Layout map is provided as Attachment 1-23.

Witness: Marty Marchaterre



PROJECT INFORMATION	
UTILITY:	EKPC
UTILITY PROJECT NUMBER:	TBD
INTERCONNECTION VOLTAGE (kV):	69
IA AC GRID LIMIT (MW):	60
AC POI CAPACITY (MW):	54.0
AC INVERTER CAPACITY (MW):	66.0
DC CAPACITY (MW):	70.2
DC / AC:	1.3
PV MODULES	
MANUFACTURER:	CANADIAN SOLAR
MODEL:	CS7N-720TB-AG
RATING (W):	720
STRING LENGTH:	28
STRING QUANTITY:	2808
MODULE/PANEL QUANTITY:	97552
INVERTERS	
MANUFACTURER:	SUNGROW
MODEL:	SG-4400UD-MV-US
RATING (kVA):	4400
RATING (kW):	4400
QUANTITY:	15
AVERAGE IRL:	1.06
RACKING	
MANUFACTURER:	TERRASMART
MODEL:	GLIDE AGILE
TYPE:	2P FIXED
TILT (°):	60
AZIMUTH (°):	0
PITCH (FT):	31.5
GCR (%):	50%
SITE CONDITIONS	
LEASE ACREAGE:	307
LENGTH OF FENCELINE (FT):	25,114
LAT / LON (POI):	36.7743, -85.0077
TOTAL INTERNAL ROAD LENGTH (FT)	11,900

SHEET SYMBOLOGY

- PROJECT BOUNDARY
- EXCLUSION AREAS
- PARCEL BOUNDARY
- SECURITY FENCE
- 100 YEAR FLOOD PLAIN
- DELINEATED JURISDICTIONAL WETLAND
- LAYDOWN AREA
- PROPOSED POLLINATOR AREA

GENERAL NOTES:

1. ALL LOCATIONS BASED ON GIS DATA AND ARE APPROXIMATE AND SUBJECT TO CHANGE.
2. WETLAND DELINEATION DATA OBTAINED FROM COPPERHEAD ENVIRONMENTAL CONSULTANT REPORT 2/5/24.
3. PROJECT SPECS LISTED ARE PRELIMINARY AND SUBJECT TO CHANGE.
4. INVERTER LOCATIONS ARE PRELIMINARY AND SUBJECT TO CHANGE BASED ON FUTURE PROJECT CONSTRAINTS AND ELECTRICAL DESIGN.

N

0 400 800 Feet

BIRCH CREEK ENERGY
2650 LOCUST ST.
STE #100
ST. LOUIS, MO 63103

BIRCH CREEK

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	
1	11/27/24	PRELIMINARY SITE PLAN WITH DESKTOP CONSTRAINTS	AGS
2	06/02/25	UPDATED PRELIMINARY SITE PLAN WITH DESKTOP CONSTRAINTS	MEC
3	07/11/25	UPDATED APPROX. LOCATIONS OF LAYDOWN AND SITE ROADS	MEC
4	08/05/25	UPDATED EXCLUSION AREAS AND FENCE LINE	DNN
5	12/24/25	SITING BOARD UPDATES	MEC

BARRELHEAD
ALPHA, KY
36.7743, -85.0077

SHEET TITLE
PRELIMINARY SITE PLAN

SHEET # E-001 | PAGE 01 OF 01

Siting Board 1-24:

Refer to the SAR, Appendix B, Preliminary Site Layout and Appendix I, Traffic Impact Study. Provide the total number of gates along the fenced parcels of solar arrays, including access points and interior gates. Provide a revised Preliminary Site Layout map with all gate locations depicted.

Response: A revised Preliminary Site Layout plan with all gate locations identified is provided as Attachment 1-23. The Project has seven access points with gates.

Witness: Marty Marchaterre

Siting Board 1-25:

Explain whether each access entrance available during the construction period and during the operational period will have its own security gate.

Response: Each access entrance will be available during the construction period and during the operational period for maintenance. Each entrance will have its own security gate, and all gates will be locked when not in use.

Witness: Marty Marchaterre

Siting Board 1-26:

Provide details about the proposed access roads, including total length, width(s) and material(s) used.

Response: Barrelhead Solar currently anticipates the construction of approximately 11,900 linear feet of access roads on the project site. Each access road is planned to be 13 feet wide and will be graveled.

Witness: Marty Marchaterre

Siting Board 1-27:

Provide a detailed description of construction activities, including a construction timeline and schedule by activity, accounting for site preparation and construction of all Project components.

Response: See RFI 1-10 for construction timeline.

The main construction activities consist of the following:

1. Vegetation removal (where necessary)
2. Civil works: Overall site preparation including grading, building of retention ponds (or other stormwater facilities), internal roads, and perimeter fencing. Several civil works continue simultaneously while other activities start.
3. Installation of steel piles
4. Assembly of mounting structures
5. Trenching or boring for medium voltage cables
6. Installation of modules on mounting structures
7. Installation of power conversion stations and electrical connections
8. Testing and commissioning

Note: The project's substation and interconnection line will be built independently by the Eastern Kentucky Power Cooperative. Construction of the project substation is not tied to construction activity of the solar facility; however, the project substation and transmission line must be completed before or at the same time as the solar facility. Barrelhead Solar will coordinate with the Eastern Kentucky Power Cooperative on scheduling and construction.

Witness: Trudie Grattan

Siting Board 1-28:

State when the peak construction phases will occur (which month(s) of the full construction period), accounting for construction of all Project components.

Response: Construction is currently anticipated to start during the first quarter of 2028. Construction is expected to take 9 to 12 months, with peak construction occurring during months 3 to 7 of the construction period. See Response to RFI 1-10.

Witness: Trudie Grattan

Siting Board 1-29:

Provide the average number of construction workers on-site each day over the course of the construction period, accounting for construction of all Project components.

Response: On average, it is anticipated that approximately 50 to100 workers will be on site each day. This number could increase to 100 to 150 workers each day during peak periods.

Witness: Marty Marchaterre

Siting Board 1-30:

Refer to the SAR, Section 4 Noise and Section 6 Mitigation, Item 14, which state different times of day in which construction activities would occur. Clarify the days of the week and times of day during which general construction activities would occur and during which higher noise producing activities would occur.

Response: Construction activity will be limited to the hours of 7 a.m. to 7 p.m., Monday through Saturday, over a period of approximately 8 to 12 months. Construction activities that create a higher level of noise, such as pile driving, will be limited to 8 a.m. to 5 p.m., Monday through Friday. Although non-noise-causing construction activities can take place from 6 a.m. to 10 p.m., Monday through Sunday (i.e., field visits, arrival/departure), select non-noise-causing activity and non-construction work may be required during night hours when equipment is not energized.

Routine operation and maintenance activities would take place on fewer than half of the days of the year and may take place during typical daytime hours, from 8 a.m. to 5 p.m., Monday through Friday. Non-noise-causing activities may be carried out during nighttime hours for up to 50 days per year.

Witness: Marty Marchaterre

Siting Board 1-31

Refer to the SAR, Appendix E, Noise Analysis. State whether any of the residential structures located within 2,000 feet of the Project boundary (Table 1) are owned by participating landowners. If so, identify those homes owned by participating landowners.

Response: Initially, only non-participating residences were analyzed in the Noise Analysis that was provided to the Siting Board as SAR, Appendix E. However, in response to RFI 1-46, Barrelhead Solar has provided a revised Noise Analysis report that includes homes owned by the landowners at 475 Massingale Road and 1837 KY 1009. The revised Noise Analysis is provided as Attachment 1-46.

Witness: Marty Marchaterre

Siting Board 1-32:

Refer to the SAR, Appendix E, Noise Analysis. State whether any of the residential structures located within 2,000 feet of the Project boundary (Table 1) are owned by participating landowners. If so, identify those homes owned by participating landowners.

Response: See response to RFI 1-31, above.

Witness: Marty Marchaterre

Siting Board 1-33:

Refer to the Application and the SAR, Attachment H, Cumulative Environmental Assessment. Explain whether laydown areas will comprise 10-15 acres of the site per the Application or 20-25 acres of the site per Attachment H.

Response: Based on the latest Preliminary Site Layout, Barrelhead Solar has identified two laydown areas that will comprise approximately 2.8 acres in total (See Attachment 1-23). However, it is anticipated that the EPC contractor, once selected, will designate other laydown areas within the Project Area as construction occurs.

Witness: Marty Marchaterre

Siting Board 1-34:

Refer to the SAR, Appendix B, Preliminary Site Layout. Provide the acreage for each of the indicated laydown areas.

Response: The laydown area at the northern end of the Project Area is approximately 1.31 acres, and the laydown area in the southwestern part of the Project Area is approximately 1.49 acres (See Attachment 1-23).

Witness: Marty Marchaterre

Siting Board 1-35:

Provide details of any communications to date with the Wayne County Road Department.

Response: To date, the project has not had any communications with the Wayne County Road Department. The EPC contractor will engage the Wayne County Road Department prior to construction.

Witness: Trudie Grattan

Siting Board 1-36:

Provide details of any communications to date with the Clinton County Road Department.

Response: To date, the project has not had any communications with the Clinton County Road Department. The EPC contractor will engage the Clinton County Road Department prior to construction if any Clinton County roads are to be used.

Witness: Trudie Grattan

Siting Board 1-37:

Provide the method and route for delivery of the Project Transformer(s).

Response: The transformer is expected to be delivered via truck. Once selected, the EPC contractor will determine the delivery route for the transformer.

Witness: Marty Marchaterre

Siting Board 1-38:

Provide the average daily number of construction vehicles accessing the site, by vehicle type, i.e., worker vehicles, delivery trucks, cement trucks, water trucks (if utilized), other.

Response: On average, Barrelhead Solar anticipates around 50 worker vehicles per day to access the site. On an average day, it is expected at most for 5, or fewer, Class 8 semi tractor-trailers with gross vehicle weight rating (GVWR) up to 80,000 lbs. to access the site. Some deliveries may arrive on Class 4 to 6 medium-duty trucks with GVWR up to 26,000 lbs.

Witness: Marty Marchaterre

Siting Board 1-39:

Provide the peak daily number of construction vehicles accessing the site, by vehicle type, i.e., worker vehicles, delivery trucks, cement trucks, water trucks (if utilized), other.

Response: During the peak construction period, the number of worker vehicles may range from approximately 50 to 100 vehicles at peak. Workers will be encouraged to carpool to reduce the total number of vehicles. During the peak delivery period, Barrelhead Solar estimates between 10 to 20 Class 8 semi tractor-trailers with GVWR up to 80,000 lbs. will access the site per day.

Most of the light-duty trucks onsite will be worker vehicles. Heavy duty trucks are expected to be either Class 4 to 6 medium-duty trucks with GVWR up to 26,000 lbs. or Class 8 semi tractor-trailers with GVWR up to 80,000 lbs.

Witness: Marty Marchaterre

Siting Board 1-40:

Explain whether any oversize or overweight deliveries will require special permits.

Response: The EPC Contractor will determine delivery routes per the road and bridge capacities when developing the haul routes. Barrelhead Solar will ensure that the EPC coordinates with state and local road departments if any oversized or overweight vehicles are needed for delivery during construction, any upgrades to any roads are necessary for oversized or overweight vehicles are necessary, or repairs of any damage to local roads is required.

Witness: Marty Marchaterre

Siting Board 1-41

Explain whether any improvements to roadways in the Project area will be necessary prior to construction.

Response: At this time, Barrelhead Solar does not anticipate improvements to roadways will be needed prior to the delivery and construction phases of the project. However, once an EPC contractor is selected, the EPC will review whether improvements are needed for transporting equipment or materials.

Witness: Marty Marchaterre

Siting Board 1-42:

Explain whether any traffic stoppages will be necessary to accommodate large truck deliveries. If yes, provide the expected location(s), frequency and length of those stoppages.

Response: Any necessary traffic stoppages will be identified once the EPC is selected and the delivery haul routes are determined. The traffic management plan will also be developed upon the selection of the EPC. The EPC will be responsible for communication and coordination with the Kentucky Transportation Cabinet and the County prior to any large truck deliveries, and it will also manage and flag traffic around the project as necessary.

Barrelhead Solar is committed to implementing mitigation measures to reduce construction-vehicle related traffic congestion (as outlined in SAR, Appendix I, Traffic Study), including developing and implementing a traffic management plan. The traffic management plan will be developed in coordination with both state and local road departments.

Witness: Marty Marchaterre

Siting Board 1-43:

Refer to the SAR, Appendix I, Traffic Impact Study. Provide the estimated weight of the project's required substation transformer and the truck class necessary for its delivery.

Response: At this time, the estimated weight of the substation transformer is 206,000 pounds shipped. Barrelhead Solar anticipates that the truck class needed for the transformer delivery would be a Federal Highway Administration Class 8. A Class 8 is any vehicle 33,001 pounds or larger and includes 18-wheelers and tractor trailers. The truck class will be determined by the transportation provider for this delivery.

Witness: Marty Marchaterre

Siting Board 1-44:

Describe odor impacts from diesel fumes or other sources from construction vehicles that may be noticeable to nearby residents.

Response: Odor impacts are not anticipated because construction vehicles will be parked onsite, and no additional fumes outside normal daily traffic are expected. It is not anticipated that the Project will have noticeable odor impacts on nearby residents.

Witness: Marty Marchaterre

Siting Board 1-45:

Explain whether a plan to coordinate construction activities around the schedules of local churches has been or will be developed. Provide that plan, if developed.

Response: A construction coordination plan has not been developed at this time. Barrelhead Solar will work with leaders from local churches to coordinate construction activities around church services and activities.

Witness: Trudie Grattan

Siting Board 1-46:

Refer to the SAR, Appendix E, and Noise Analysis. The residential receptors located at 1837 KY 1009 (next to the church) and at 475 Massingale Road were not included in the report, tables, or figures. Provide a revised Noise Analysis that includes these residences.

Response: The two identified residential receptors were not included in the report because they are participating residential structures. A revised Noise Analysis is provided as Attachment 1-46 and these residential receptors are included in the revised noise analysis.

Witness: Marty Marchaterre

COPPERHEAD
ENVIRONMENTAL CONSULTING

Acoustical Analysis for the Proposed Barrelhead Solar Project Wayne County, Kentucky



Prepared for:

Barrelhead Solar, LLC

Revised

21 November 2025

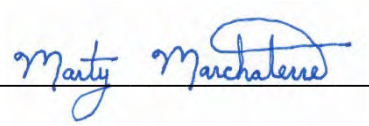
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November 21, 2025

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INTRODUCTION

Barrelhead Solar, LLC (the Applicant) proposes to construct a solar energy facility (the Project in Wayne County. The Project would be situated on approximately 307 acres and is located on KY 1009 and Massingale Road, southwest of the city of Monticello, Kentucky (Figure 1).

The Project is an approximately 54 megawatt (MW) solar facility that would generate electricity using photovoltaic solar panels. It would include solar panel arrays, inverter boxes, a utility interconnection substation, transformer, and overhead and underground electrical conveyance lines.

EXISTING LAND USE AND SITE CONDITIONS

According to the National Land Cover Database (NLCD) for Wayne County, the Project Area currently consists of agricultural fields/cultivated crops and pasture (Figure 2). Historically, the Project Area has been used for agriculture. Land uses on adjacent properties include agriculture, scattered wood lots, and rural residences.

NOISE ANALYSIS METHODOLOGY AND APPROACH

Noise is generally described as unwanted sound, which can be based either on objective effects (hearing loss, damage to structures, etc.) or subjective judgments (such as community annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as sound level. To better reflect human hearing sensitivity, noise levels are adjusted using A-weighted decibels (dBA).

There are often several metrics available to understand sound levels, including L_{min} and L_{max}. These metrics represent the lowest and maximum, respectively, sound levels measured during a single noise event. Although these can be useful to understand on their own, the dBA scale is based on a combination of intensity and how the human ear responds, and more accurately achieves a strong correlation with how people perceive acceptable and unacceptable sound levels. Several examples of typical sound levels in dBA are in Table 1. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Table 1. Sound Levels of Common Activities/Situations.

Activity/Event	dB	Effect
Lowest audible sound to person with normal hearing	0	
Rustling leaves	20	Just audible
Whisper	20	Very quiet

Activity/Event	dB	Effect
Refrigerator humming	40	
Quiet office	50-60	Comfortable hearing levels are under 60 dB
Normal conversation	50-65	
Vacuum cleaner, hair dryer	70	Intrusive; interferes with telephone conversation
Washing machine	78	
Average city traffic	80	Annoying, interferes with conversation; constant exposure my cause damage
Lawnmower, recreational vehicles	85-90	85 dB is the level at which hearing damage (8 hrs) begins
Subway	88	Very annoying
Farm tractor	98	
Electric furnace area, garbage truck	100	No more than 15 minutes of unprotected exposure recommended for noises between 90-100 dB
Symphony orchestra, power saw (chainsaw)	110	Regular exposure to noise over 100 dB for more than 1 minute risks permanent hearing loss
Boom box or nearby thunderclap	120	Threshold of sensation begins around 120 dB
Shotgun firing, jet takeoff (100-200 ft)	130	Threshold of pain begins around 125 dB
Jet engines (near)	140	

Source: American Academy of Audiology 2010.

Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (Ldn), measured in dBA. Ldn is the community noise metric recommended by the US Environmental Protection Agency (USEPA) and has been adopted by most federal agencies (USEPA 1974). A Ldn of 65 dBA is the most common level for noise planning purposes and represents a compromise between community impact and the need for activities such as construction. Because sound is described in a logarithmic scale (i.e., dBA), sound levels cannot be added by ordinary arithmetic. An increase of 3 dBA represents a doubling of sound energy, so two helicopters flying side-by-side would be 3 dBA louder than one. A 6-

dBA increase represents four times more energy and this increase generally allows for sounds to be heard from twice as far.

Areas exposed to a Ldn above 65 dBA for a consistent 24-hour period every day are generally not considered suitable for residential use. A Ldn of 55 dBA was identified by USEPA as a level below which there is no adverse impact (USEPA 1974). The dynamics of noise are based on the relationship between the source of the noise, the person or place exposed to the noise (the receiver) and the path the noise will travel from source to receiver (HUD 1985).

EXISTING SOUND CONDITIONS

Nearest Sensitive Receptors

Sound-sensitive receptors are generally defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Typically, sound-sensitive land uses include residences, hospitals, places of worship, libraries, performance spaces, offices, and schools, as well as nature preserves, recreational areas, and parks.

Receptors adjacent to the Project Area are nearby residences located primarily along KY 1009, Massingale/Pleasant Ridge Road, and Happy Top Road (Figure 3). Non-residential receptors include a church, cemeteries, agricultural buildings, and the Alpha Post Office (Figure 4). A total of 58 non-participating receptors, which are primarily residences (52), were identified within 2,000 feet of the Project Area boundary. There are two participating receptors located at 475 Massingale Road and 1837 KY 1009.

The nearest non-participating receptor to a proposed solar array is the Buncan Cemetery (NR-05) located on KY 1009, approximately 161 feet from the nearest array. The Buncan Cemetery is also the closest receptor to a proposed inverter pad, approximately 463 feet away. The nearest receptor is approximately 1,616 feet from the proposed substation (R-24). Table 1 displays the distance from each receptor to the nearest proposed solar infrastructure.

Table 2. Residential (R) and Non-Residential (NR) Receptors within 2000-ft of the Project Area, Distances to the Nearest Infrastructure Components.

Receptor ID	Distance to Project Area Boundary (feet)	Distance to Nearest Array (feet)	Distance to Substation (feet)	Distance to Nearest Inverter (feet)
Non-Participating Structures				
R-01	1,689	1,750	4,793	2,458
R-02	414	502	4,088	930
R-03	168	252	3,851	744
R-04	98	205	3,646	908
R-05	95	182	3,723	542
R-06	814	940	4,178	1,274
R-07	470	534	3,140	1,099
R-08	309	372	2,952	840
R-09	190	277	3,570	986
R-10	257	353	3,280	1,086
R-11	593	750	3,549	1,493
R-12	1,087	1,192	3,438	1,893
R-13	1,258	1,384	3,199	2,020
R-14	307	442	2,044	758
R-15	78	214	1,854	529
R-16	1,668	2,032	3,623	2,701
R-17	182	293	1,630	739
R-18	951	1,068	2,383	1,407
R-19	998	1,431	3,214	2,172
R-20	1,403	1,456	2,683	1,664
R-21	1,517	1,981	3,902	2,740
R-22	608	664	1,757	761
R-23	701	741	1,780	898
R-24	547	592	1,616	842
R-25	1,855	2,245	4,175	2,969
R-26	954	1,131	2,430	1,434
R-27	1,380	1,546	3,011	1,913
R-28	1,005	1,170	2,421	1,480
R-29	1,629	1,796	3,211	2,148
R-30	1,340	1,506	2,745	1,815
R-31	1,490	1,676	2,994	1,987
R-32	1,315	1,480	2,685	1,792
R-33	960	1,145	1,812	1,789
R-34	1,297	1,465	2,627	1,779
R-35	1,300	1,476	2,562	1,789

Receptor ID	Distance to Project Area Boundary (feet)	Distance to Nearest Array (feet)	Distance to Substation (feet)	Distance to Nearest Inverter (feet)
R-36	1,209	1,437	2,435	1,803
R-37	1,540	1,706	2,894	2,019
R-38	1,876	2,050	3,414	2,386
R-39	1,810	1,992	3,255	2,295
R-40	1,284	1,478	2,348	1,994
R-41	1,345	1,562	2,522	1,991
R-42	1,478	1,708	2,706	2,050
R-43	1,516	1,718	2,603	2,205
R-44	1,562	1,757	2,607	2,264
R-45	1,623	1,811	2,620	2,339
R-46	1,569	1,785	2,454	2,396
R-47	1,926	2,151	3,126	2,518
R-48	1,905	2,090	2,754	2,740
R-49	1,912	2,108	2,935	2,609
R-50	1,959	2,170	3,074	2,614
R-51	1,946	2,209	2,906	2,728
R-52	2,011	2,248	2,983	2,756
NR-01	1,170	1,248	4,705	1,587
NR-02	1,984	2,082	4,771	2,819
NR-03	1,816	1,914	4,600	2,671
NR-04	75	208	3,357	525
NR-05	56	161	3,291	463
NR-06	1,905	2,086	3,343	2,389
Participating Structures				
475 Massingale Rd.	117	191	1041	459
1837 KY 1009	123	175	3410	475

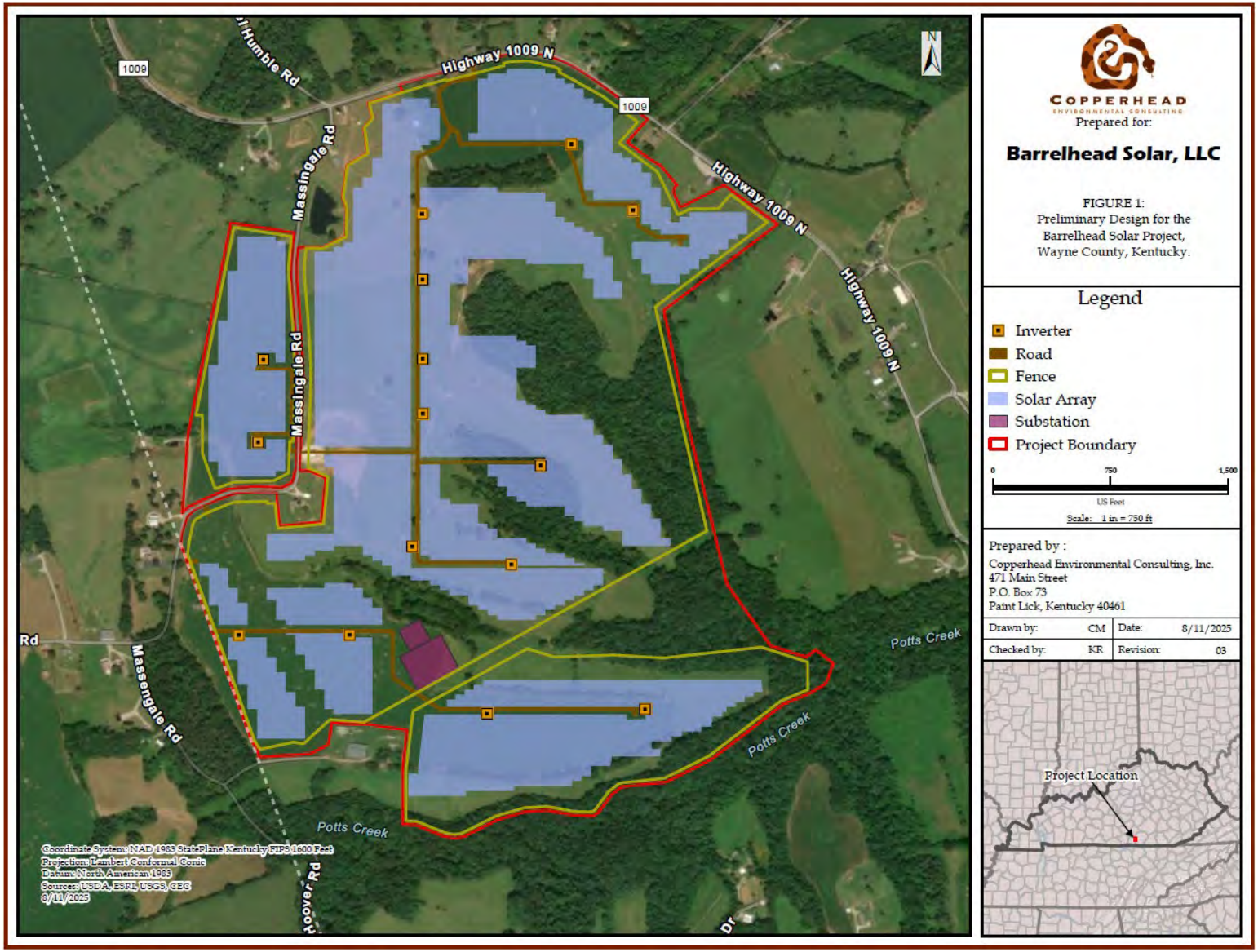


Figure 1. Project location and preliminary design plans.

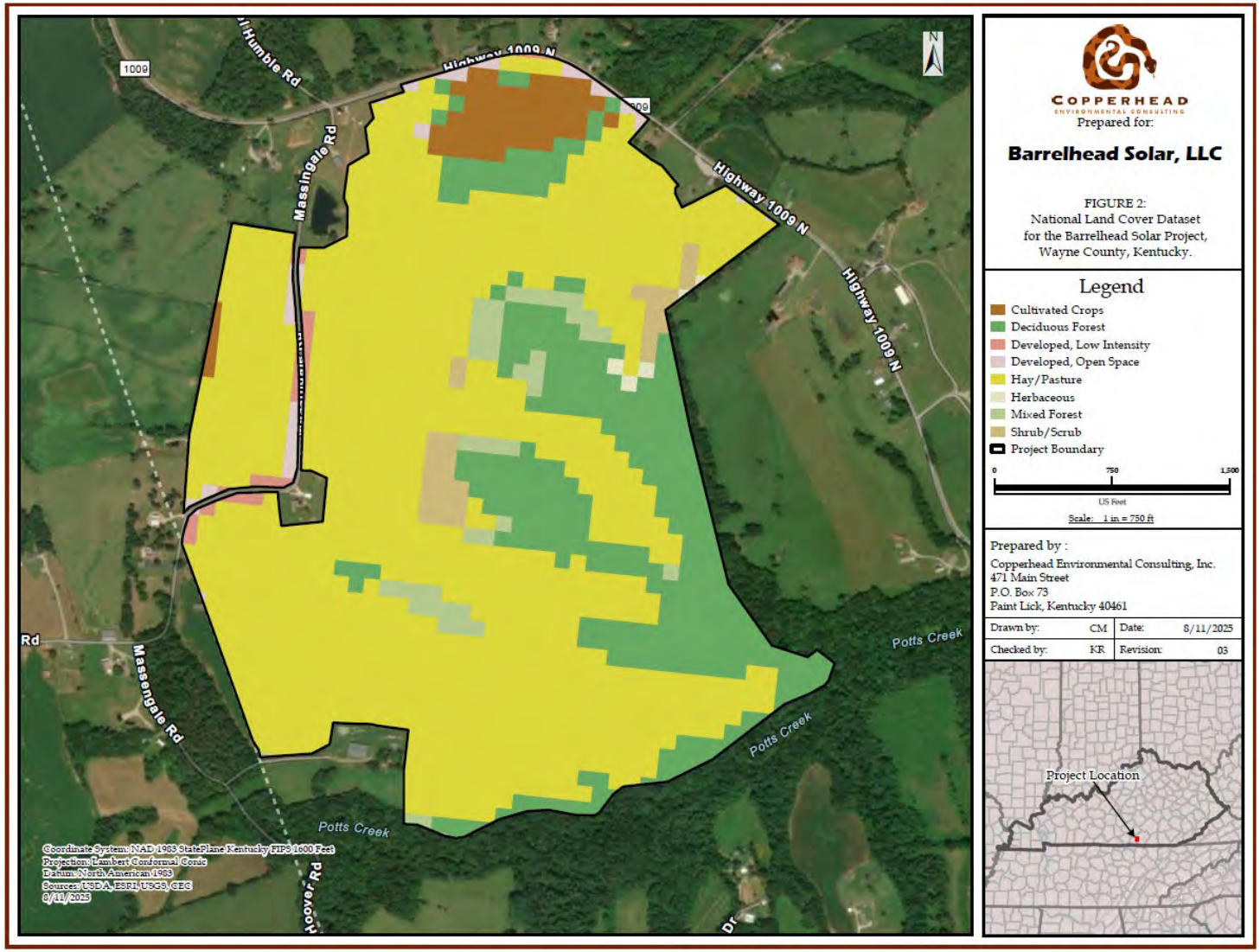


Figure 2. Land cover types within the Project Area.

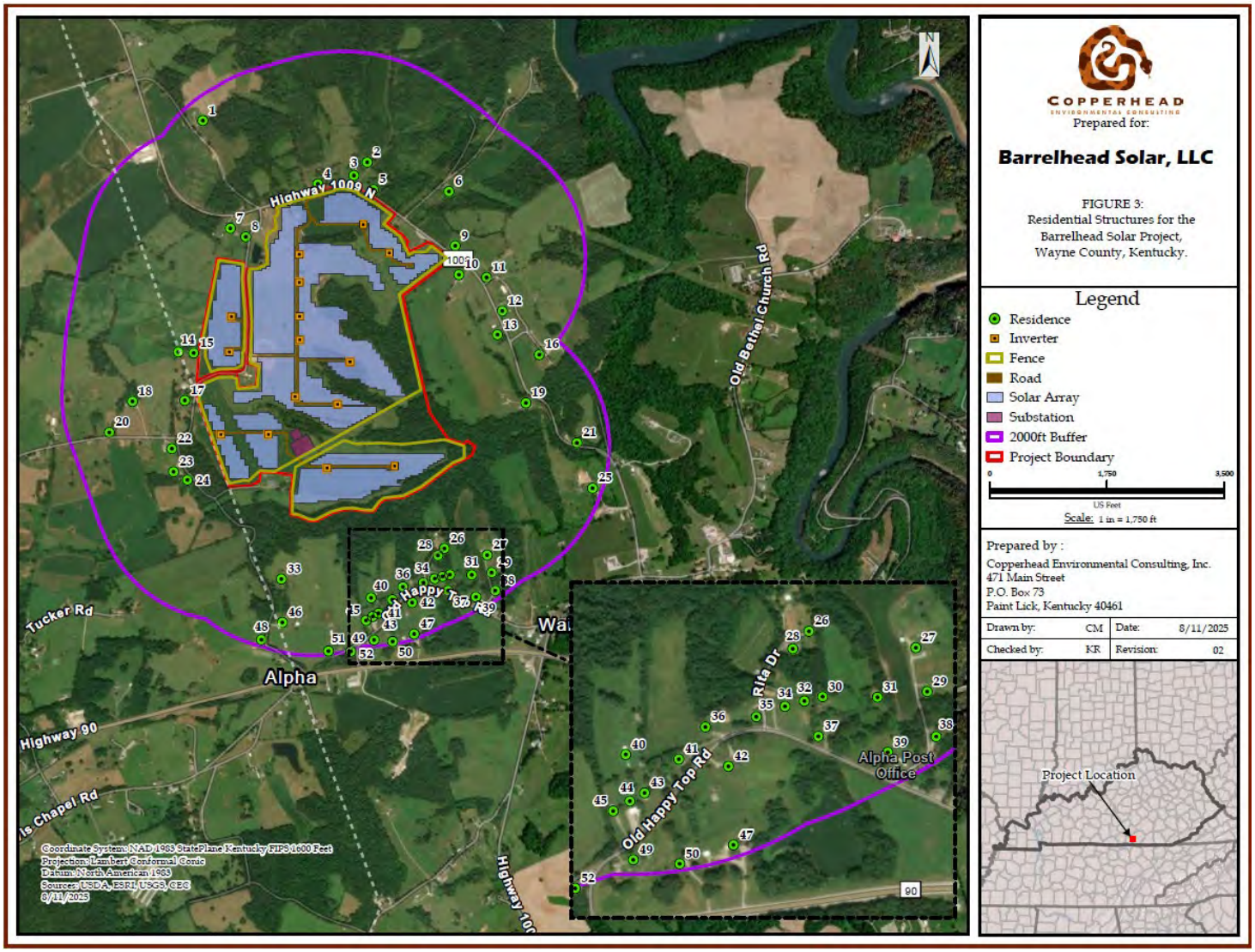


Figure 3. Non-participating residential receptors within 2,000 ft of the Project Area.

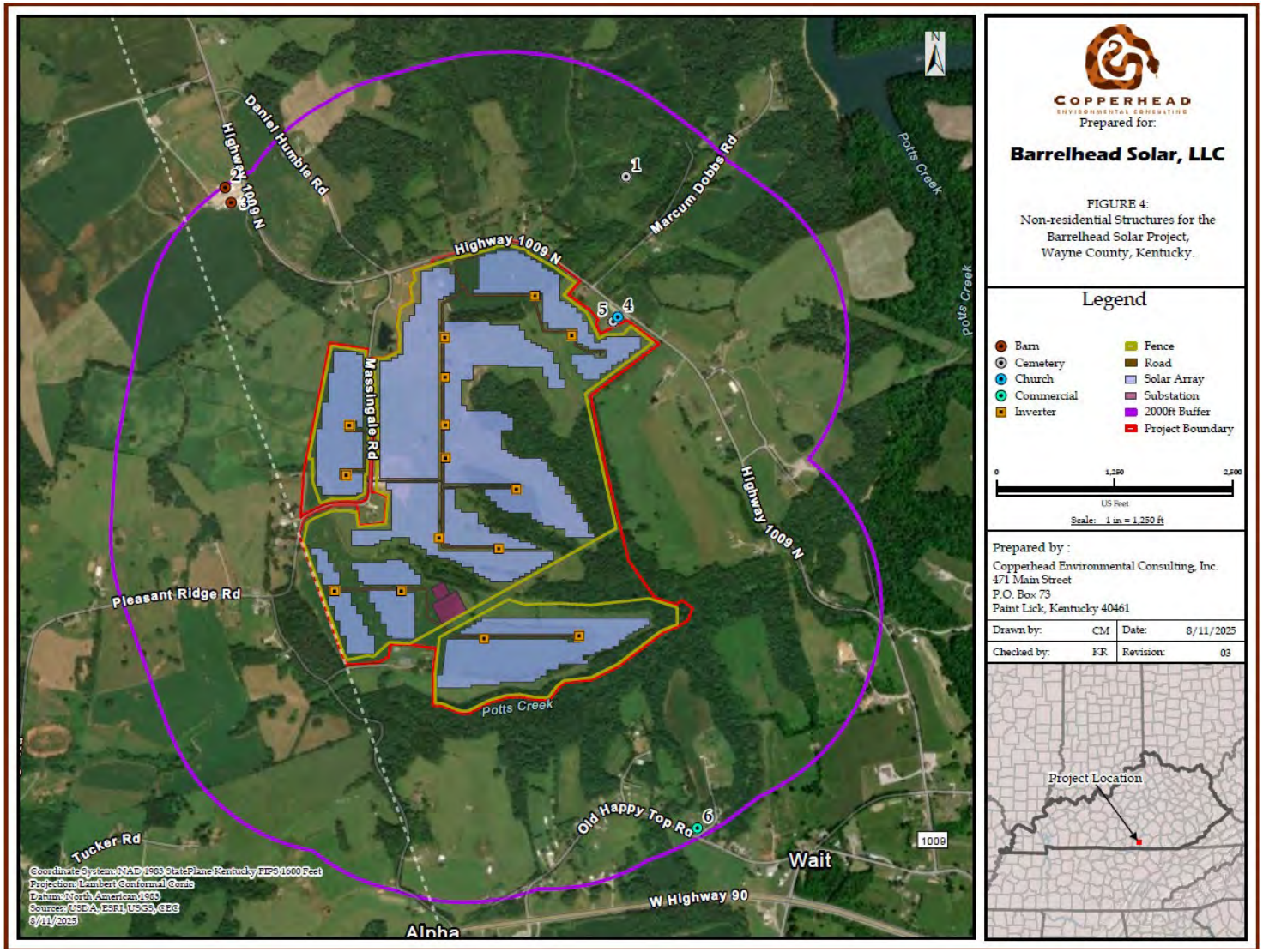


Figure 4. Non-participating non-residential receptors within 2,000 ft of the Project Area.

Existing Sound at the Project Area and from Surrounding Areas

Local conditions such as traffic, topography, and wind can alter background sound conditions. In general, the Ldn sound levels for outdoor quiet rural nighttime conditions are considered to be approximately 25 dBA (EPA 1974). Sound levels attenuate (or diminish) at a rate of approximately 6 dBA per doubling of distance from an outdoor point source due to the geometric spreading of the sound waves. The inverse square law is used to estimate noise levels at different distances.

The analysis area is within an agricultural, rural-residential, and undeveloped area of Livingston County. Ambient sound within the analysis area consists mainly of agricultural sounds, such as noise from farm machinery; natural sounds, such as from wind and wildlife; and moderate traffic sounds. Sound levels of these types generally range from 45 to 55 dBA (USDOT 2017).

Typical sounds produced from farming and agriculture activities surrounding the Project Area include trucks, all-terrain vehicles (ATVs), tractors, and other farming equipment. The adjacent farms produce sound similar to those within the analysis area. Table 3 lists the sound level of common agricultural sounds.

Table 3. Decibel Ratings of Common Agricultural Sounds.

Decibel	Sound
30	Crickets, distant frogs, whisper
40	Kitten meowing, songbirds, distant dog bark
50	Babbling stream, quiet empty barn
60	Average conversation level
70	Chicken coop, busy restaurant.
80	Tractor idling, barn cleaner, conveyors, elevators.
90	Tractor at 50 percent load, blower, compressor, combine.
100	Tractor at 80 percent load, pig squeal, power tools.
120	Tractor at full load, bad muffler, old chain saw.
140	Gunshot, backfire, dynamite blast.

Source: Texas A&M 2012.

Roadway traffic contributes to noise within the Project Area. Portions of the Project Area are bounded by two-lane roadways that receive local traffic (i.e., cars, trucks, and tractor trucks with trailering equipment). Based on Kentucky Transportation Cabinet traffic count data (accessed

July 18, 2025), the average annual daily traffic (AADT) on KY 1009 north and east of the Project Area was approximately 253 vehicles in 2022. Roadway traffic noise levels typically range from 70 to 80 dBA at approximately 50 feet and peak during normal business hours.

CONSTRUCTION SOUND CONDITIONS

Wayne County does not have a noise ordinance. The Applicant is not aware of any solar-specific United States Standards for sound mitigation during project construction or operation. Common practice is to treat solar projects like any other source of sound, applying existing laws that govern noise pollution from all sources in the applicable jurisdiction (MAREC 2021). The following sections describe Project-related noise conditions, their timing and duration, and sound levels at nearby sensitive receptors.

Construction Timing

Construction activity would be limited to the hours of 7am – 7pm, Monday through Saturday, over a period of approximately 8 – 12 months. Construction activities that create a higher level of noise, such as pile driving, will be limited to 8am – 5pm, Monday through Friday. Non-noise-causing and non-construction activities can take place between 6am and 10pm, Monday through Sunday, including field visits, arrival, departure, planning, meetings, mowing, surveying, etc.

Most construction equipment would not operate for the entire construction period, but would be phased in and out according to the progress of construction. Because construction would be limited to daytime hours, there would be no effect on ambient noise levels at night

Equipment and Machinery

Construction would use equipment typical for site development (i.e., backhoes, generators, pile drivers, and flatbed trucks). Equipment would be spread out over the entire site, with some equipment operating along the perimeter of the site while the rest of the equipment may be located from several hundred to several thousand feet from the perimeter.

The U.S. Department of Transportation Federal Highway Administration (FHWA) publishes noise levels for typical construction equipment as shown in the table below.

Table 4. Sound Levels for Common Construction Equipment.

Equipment Type	Typical Sound Level (dBA) at 50 Feet
Backhoe	80
Chainsaw	85-115
Crane (Mobile)	85

Equipment Type	Typical Sound Level (dBA) at 50 Feet
Dozer	85
Dump Truck	84
Generator	81
Grader	85
Front End Loader	80-85
Pickup Truck	55
Pile Driver	90-95
Pneumatic Tool	85
Pump	76
Roller	74
Scraper	89
Shovel	82
Spike Driver	77
Tractor	84
Truck (Flatbed)	80-90
Welder/Torch	73

Source: FHWA Construction Noise Handbook, August 2006. Table based on US EPA Report and measured data.

The most common method of installing the support posts for the solar panels is to drive them into the ground. This pile-driving procedure produces a repetitive, metallic impact sound. Individual piles take only a few minutes to be driven into the ground. Pile driving is short-lived and will take approximately six months to complete. This would occur at the earlier stages of construction, typically in the second or third month.

While standard construction pile drivers are estimated to produce approximately 101 dBA at a distance of 50 feet (USDOT 2017), the specialty pile drivers used for solar panel installation produce less noise, and the piles supporting solar panels will be driven primarily into soil. An earlier version of this report referenced the 2012 manual for the Vermeer PD10 Pile Driver. The sound level provided in the manual was 84 dBA at 50 feet and was used to analyze potential noise

impacts to receptors in the analysis area. Since this report was submitted, updated sound level data from Vermeer became available, which has been used to revise the analysis in this report.

The 2025 Vermeer PD10 Pile Driver Operator's and Maintenance Manual (see Appendix A) provides two sound levels for different engines that could be used with the Vermeer. Because it is unknown at this time which engine will be used, both sound levels have been incorporated into the analysis. Additionally, these sound levels, indicated as the dBA at the operator's ear, have been interpolated using the inverse square law to a distance of 50 feet. An estimated distance of 3 feet was used to represent "at the operator's ear" for these calculations. These engine types and respective sound levels are in Table 5.

Table 5. Vermeer PD10 Pile Driver Engine Options and Estimated Sound Levels.

Engine Option	Sound Level at Operator's Ear (3 feet) (dBA)	Sound Level at 50 feet (dBA)
Deutz Engine	114	89.6
Yanmar Engine	105	80.6

The nearest receptor is NR-05, which is approximately 161 feet from the nearest solar panel array. At this distance, temporary and intermittent construction sound levels would be between approximately 70.4-79.4 dBA, depending on the equipment specifications, when a pile driver is used to install the piles/posts for the nearest solar panel array tracking system. This sound level is temporary and will decrease within hours as sections of the array are completed and the pile driver moves further away.

Only limited concrete pouring is anticipated for the Project. Base slabs for the inverters and other electrical equipment will be precast and dropped in place. The transformer base at the substation may be poured concrete. During this time, a concrete pump truck will be needed. A concrete pump truck typically generates a sound of approximately 82 dBA at 50 feet. At the nearest receptor (1,616 feet from the substation), the sound level is estimated to be 52 dBA intermittently for a day or two.

Assembly of Solar Panel Array and Construction of Facilities

Solar panels will be manufactured off site and shipped to the site ready for installation. Assembly of the solar panel array tracking system, the installation of solar panels, inverters and other electrical equipment associated with the solar facility and substation would likely employ typical manual hand tools and power tools. These assembly operations would occur several hundred feet to thousands of feet inside the property boundary. The anticipated duration of the sound generated by power equipment would be short.

Roadway Sound During Construction

During construction, it is anticipated that there would be a temporary increase in traffic volume from commuting construction workers (up to 150 workers during peak phases), the delivery of construction equipment and material, and the delivery of solar panel components and equipment. Worker commutes with passenger vehicles and trucks would occur daily, with traffic peaks in the morning and afternoon, whereas deliveries of equipment would occur on trailers, flatbeds, or other large vehicles periodically throughout the construction process at various times of day. Based upon FHWA sound levels, the sound contributed by construction vehicles such as flatbed trucks, light passenger cars and trucks falls within acceptable ranges because the sound is of short duration.

Construction Noise Summary

Table 5 displays a summary of anticipated maximum on-site construction sound levels at each of the residential and non-residential receptors identified in Figures 3 and 4.

Table 6. Selected Maximum Anticipated Construction Sound Levels at each Receptor.

Receptor ID	Receptor Type	Distance to Nearest Array (feet)	Pile Driving, Deutz Engine – 89.6 dBA at 50 feet (dBA)	Pile Driving, Yanmar Engine – 80.6 dBA at 50 feet (dBA)	Distance to Substation (feet)	Concrete Pouring – 82 dBA at 50 feet (dBA)
Participating Structures						
R-01	Residential	1,750	58.7	49.7	4,793	42
R-02	Residential	502	69.6	60.6	4,088	44
R-03	Residential	252	75.6	66.6	3,851	44
R-04	Residential	205	77.3	68.3	3,646	45
R-05	Residential	182	78.4	69.4	3,723	45
R-06	Residential	940	64.1	55.1	4,178	44
R-07	Residential	534	69.0	60.0	3,140	46
R-08	Residential	372	72.2	63.2	2,952	47
R-09	Residential	277	74.7	65.7	3,570	45
R-10	Residential	353	72.6	63.6	3,280	46
R-11	Residential	750	66.1	57.1	3,549	45
R-12	Residential	1,192	62.1	53.1	3,438	45
R-13	Residential	1,384	60.8	51.8	3,199	46
R-14	Residential	442	70.7	61.7	2,044	50
R-15	Residential	214	77.0	68.0	1,854	51

Receptor ID	Receptor Type	Distance to Nearest Array (feet)	Pile Driving, Deutz Engine – 89.6 dBA at 50 feet (dBA)	Pile Driving, Yanmar Engine – 80.6 dBA at 50 feet (dBA)	Distance to Substation (feet)	Concrete Pouring – 82 dBA at 50 feet (dBA)
R-16	Residential	2,032	57.4	48.4	3,623	45
R-17	Residential	293	74.2	65.2	1,630	52
R-18	Residential	1,068	63.0	54.0	2,383	48
R-19	Residential	1,431	60.5	51.5	3,214	46
R-20	Residential	1,456	60.3	51.3	2,683	47
R-21	Residential	1,981	57.6	48.6	3,902	44
R-22	Residential	664	67.1	58.1	1,757	51
R-23	Residential	741	66.2	57.2	1,780	51
R-24	Residential	592	68.1	59.1	1,616	52
R-25	Residential	2,245	56.6	47.6	4,175	44
R-26	Residential	1,131	62.5	53.5	2,430	48
R-27	Residential	1,546	59.8	50.8	3,011	46
R-28	Residential	1,170	62.2	53.2	2,421	48
R-29	Residential	1,796	58.5	49.5	3,211	46
R-30	Residential	1,506	60.0	51.0	2,745	47
R-31	Residential	1,676	59.1	50.1	2,994	46
R-32	Residential	1,480	60.2	51.2	2,685	47
R-33	Residential	1,145	62.4	53.4	1,812	51
R-34	Residential	1,465	60.3	51.3	2,627	48
R-35	Residential	1,476	60.2	51.2	2,562	48
R-36	Residential	1,437	60.4	51.4	2,435	48
R-37	Residential	1,706	58.9	49.9	2,894	47
R-38	Residential	2,050	57.3	48.3	3,414	45
R-39	Residential	1,992	57.6	48.6	3,255	46
R-40	Residential	1,478	60.2	51.2	2,348	49
R-41	Residential	1,562	59.7	50.7	2,522	48
R-42	Residential	1,708	58.9	49.9	2,706	47
R-43	Residential	1,718	58.9	49.9	2,603	48
R-44	Residential	1,757	58.7	49.7	2,607	48
R-45	Residential	1,811	58.4	49.4	2,620	48
R-46	Residential	1,785	58.5	49.5	2,454	48
R-47	Residential	2,151	56.9	47.9	3,126	46
R-48	Residential	2,090	57.2	48.2	2,754	47
R-49	Residential	2,108	57.1	48.1	2,935	47

Receptor ID	Receptor Type	Distance to Nearest Array (feet)	Pile Driving, Deutz Engine – 89.6 dBA at 50 feet (dBA)	Pile Driving, Yanmar Engine – 80.6 dBA at 50 feet (dBA)	Distance to Substation (feet)	Concrete Pouring – 82 dBA at 50 feet (dBA)
R-50	Residential	2,170	56.9	47.9	3,074	46
R-51	Residential	2,209	56.7	47.7	2,906	47
R-52	Residential	2,248	56.5	47.5	2,983	46
NR-01	Clark-Coop Cemetery	1,248	61.7	52.7	4,705	43
NR-02	Agricultural	2,082	57.2	48.2	4,771	43
NR-03	Agricultural	1,914	57.9	48.9	4,600	43
NR-04	Fairview Church	208	77.2	68.2	3,357	45
NR-05	Buncan Cemetery	161	79.4	70.4	3,291	45
NR-06	Alpha Post Office	2,086	57.2	48.2	3,343	45
Participating Structures						
475 Massingale Road	Residence	191	78.0	69.0	1,041	56
1837 KY 1009	Residence	175	78.7	69.7	3,410	45

OPERATIONAL SOUND CONDITIONS

This section describes the sound conditions during Project operation. Sound power levels for Project equipment were obtained from vendor/manufacturer data and are based on preliminary design.

Solar Panel Array

The solar panel array associated with the Project includes single-axis fixed panels (module) distributed evenly across the site. There are expected to be 97,552 Canadian Solar CS7N-720TB-AG modules or similar. Since the panels would be fixed (non-tracking), they would not emit any noise during operation, and there would be no impact on nearby receptors.

Inverters

Inverters convert the DC power generated by the solar panels to AC power. Inverters generate the highest sound during sunny days. Because they do not operate at night, the sound produced is minimal and typically a result of cooling fans (Kaliski et al. 2020). The Project includes approximately 15 photovoltaic inverters, expected to be Sungrow SG-4400UD-MV-US inverters or similar. The data sheet provided by Sungrow does not identify actual measured levels of sound produced by the specified inverter. Inverter sound levels can vary widely, from 25 dBA to more than 80 dBA. A review of Sungrow inverters indicates that they are designed to operate more quietly compared to other available inverters. Although it is likely to be lower, a conservative estimate of 80 dBA produced by an inverter at 3 feet was determined to be sufficient for this analysis. The sound produced by an inverter is described as a hum and has roughly the same sound level as a household refrigerator. A study of solar power facility acoustics in Massachusetts found that at 150 feet from an inverter pad, sound levels approached background levels (Guldberg 2012). While there are multiple inverters planned for the Project, sound levels were estimated for the nearest inverter to each receptor instead of calculating the average distance and average sound level of all of the inverters, which would likely discount the noise experienced from the nearest inverter.

The nearest inverter is approximately 463 feet from NR-05, which is the Buncan Cemetery. The approximate level of noise at this location from the nearest inverter is 35 dBA, which is lower than the average conversation level of 60 dBA (see Table 3).

Transformer

The main transformer at the substation is anticipated to be a 69kV/34.5kV 40/53/66 MVA transformer. Per National Electronic Manufacturers Association (NEMA) ST-20 standards, it is estimated that the transformer at a substation would generate sound levels of approximately 50 dBA at 3.2 feet (Schneider Electric 2020). Sound from transformers is produced by alternating current flux in the core that causes it to vibrate, and is characterized as a discrete low frequency

hum. Because the transformer is relatively quiet and the nearest receptor to the substation is over 1,000 feet away (R-24), it is anticipated that the transformer would not be audible to any receptors. Where values in Table 6 are marked as "N/A," the estimated sound would be below the threshold of human hearing.

Operational Noise Summary

Table 6 displays a summary of estimated maximum on-site operational sound levels at each of the residential and non-residential receptors identified in Figures 3 and 4.

Table 7. Maximum Anticipated Operational Sound Levels at each Sensitive Receptor.

Receptor ID	Receptor Type	Distance to Nearest Inverter (feet)	Inverters – 80 dBA at 3 feet (dBA)	Distance to Substation (feet)	Substation – 50 dBA at 3 feet (dBA)[1]
Non-participating Structures					
R-01	Residential	2,458	22	4,793	N/A
R-02	Residential	930	30	4,088	N/A
R-03	Residential	744	32	3,851	N/A
R-04	Residential	908	30	3,646	N/A
R-05	Residential	542	35	3,723	N/A
R-06	Residential	1,274	27	4,178	N/A
R-07	Residential	1,099	29	3,140	N/A
R-08	Residential	840	31	2,952	N/A
R-09	Residential	986	30	3,570	N/A
R-10	Residential	1,086	29	3,280	N/A
R-11	Residential	1,493	26	3,549	N/A

[1] Values are marked N/A where the sound level is anticipated to be below the threshold of human hearing based on the approximate sound level generated by the equipment and the distance of the receptor.

Receptor ID	Receptor Type	Distance to Nearest Inverter (feet)	Inverters – 80 dBA at 3 feet (dBA)	Distance to Substation (feet)	Substation – 50 dBA at 3 feet (dBA)[1]
R-12	Residential	1,893	24	3,438	N/A
R-13	Residential	2,020	23	3,199	N/A
R-14	Residential	758	32	2,044	N/A
R-15	Residential	529	35	1,854	N/A
R-16	Residential	2,701	21	3,623	N/A
R-17	Residential	739	32	1,630	N/A
R-18	Residential	1,407	27	2,383	N/A
R-19	Residential	2,172	23	3,214	N/A
R-20	Residential	1,664	25	2,683	N/A
R-21	Residential	2,740	21	3,902	N/A
R-22	Residential	761	32	1,757	N/A
R-23	Residential	898	30	1,780	N/A
R-24	Residential	842	31	1,616	N/A
R-25	Residential	2,969	20	4,175	N/A
R-26	Residential	1,434	26	2,430	N/A

Receptor ID	Receptor Type	Distance to Nearest Inverter (feet)	Inverters – 80 dBA at 3 feet (dBA)	Distance to Substation (feet)	Substation – 50 dBA at 3 feet (dBA)[1]
R-27	Residential	1,913	24	3,011	N/A
R-28	Residential	1,480	26	2,421	N/A
R-29	Residential	2,148	23	3,211	N/A
R-30	Residential	1,815	24	2,745	N/A
R-31	Residential	1,987	24	2,994	N/A
R-32	Residential	1,792	24	2,685	N/A
R-33	Residential	1,789	24	1,812	N/A
R-34	Residential	1,779	25	2,627	N/A
R-35	Residential	1,789	24	2,562	N/A
R-36	Residential	1,803	24	2,435	N/A
R-37	Residential	2,019	23	2,894	N/A
R-38	Residential	2,386	22	3,414	N/A
R-39	Residential	2,295	22	3,255	N/A
R-40	Residential	1,994	24	2,348	N/A
R-41	Residential	1,991	24	2,522	N/A

Receptor ID	Receptor Type	Distance to Nearest Inverter (feet)	Inverters – 80 dBA at 3 feet (dBA)	Distance to Substation (feet)	Substation – 50 dBA at 3 feet (dBA)[1]
R-42	Residential	2,050	23	2,706	N/A
R-43	Residential	2,205	23	2,603	N/A
R-44	Residential	2,264	22	2,607	N/A
R-45	Residential	2,339	22	2,620	N/A
R-46	Residential	2,396	22	2,454	N/A
R-47	Residential	2,518	22	3,126	N/A
R-48	Residential	2,740	21	2,754	N/A
R-49	Residential	2,609	21	2,935	N/A
R-50	Residential	2,614	21	3,074	N/A
R-51	Residential	2,728	21	2,906	N/A
R-52	Residential	2,756	21	2,983	N/A
NR-01	Clark-Coop Cemetery	1,587	26	4,705	N/A
NR-02	Agricultural	2,819	21	4,771	N/A
NR-03	Agricultural	2,671	21	4,600	N/A
NR-04	Fairview Church	525	35	3,357	N/A

Receptor ID	Receptor Type	Distance to Nearest Inverter (feet)	Inverters – 80 dBA at 3 feet (dBA)	Distance to Substation (feet)	Substation – 50 dBA at 3 feet (dBA)[1]
NR-05	Buncan Cemetery	463	36	3,291	N/A
NR-06	Alpha Post Office	2,389	22	3,343	N/A
Participating Structures					
475 Massingale Rd.	Residence	459	36	1,041	N/A
1837 KY 1009	Residence	475	36	3,410	N/A

MAINTENANCE SOUND CONDITIONS

Vehicular Traffic

Traffic associated with project maintenance will include occasional light duty trucks an average of 2 or 3 days per week, for staff responsible for maintaining vegetation or performing maintenance or repairs. For vegetation management, periodic truck traffic will occur to deliver and move sheep as part of solar grazing activities or for transporting mowing equipment.

In addition, work may be conducted at night up to 50 days a year. While workers are not anticipated onsite on most weekends, it remains a possibility in the event of the need for timely repairs, or groundskeeping dictated by weather. Employees are anticipated to use mid- or full-sized trucks and would have less contribution to traffic noise than a typical single-family home.

Maintenance Activities

Typical maintenance activities include minor repair and maintenance on the solar panels, tracking systems, electrical wiring, or maintenance/inspections of the inverters/transformer. It is anticipated that trimming and mowing would be performed approximately 20-30 times per year, depending on vegetation growth rate. Periodic mowing would produce sound levels comparable to roadway traffic in the surrounding area, although at less frequent intervals. The Applicant anticipates primarily using sheep and solar grazing to maintain vegetation. It is anticipated that the Project will generate less noise during vegetation management than the average solar project.

MITIGATION MEASURES

The Applicant would implement the following measures during and after the construction phase to reduce and minimize noise impacts.

- Construction activities, processes, and deliveries will be limited to the hours between 7:00 am and 7:00 pm, Monday through Saturday; construction activities that create a higher level of noise, such as pile-driving, will be limited to 8 a.m. to 5 p.m. local time, Monday through Friday. Non-noise-causing and non-construction activities can take place on the site between 6 a.m. and 10 p.m. local time, Monday through Sunday, including field visits, arrival, departure, planning, meetings, mowing, surveying, etc.
- Based on previous experience constructing solar projects, the Applicant believes that noise concerns resulting from pile driving activities are most effectively managed through limiting pile driving activities within a certain radius to certain hours during the day to avoid potentially impacting nearby receptors. To this end, the Applicant proposes to limit pile driving activities within 1,000 feet of potentially impacted receptors to a reduced period.

- If the pile-driving activity occurs within 1,500 feet of a noise-sensitive receptor, the Applicant would implement a construction method that will suppress the noise generated during the pile-driving process (i.e., semi-tractor and canvas method, sound blankets on fencing surrounding the solar site, or any other comparable method). The Applicant may forego using noise suppression measures if it employs a panel installation method that does not use pile driving, so long as that method does not create noise levels similar to pile driving.
- The Applicant plans to notify residents and businesses within 2,400 feet of the project boundary about the construction plan, the noise potential, any mitigation plans, and its Complaint Resolution Program, at least one month prior to the start of construction.
- The Applicant would place panels, inverters, and substation equipment consistent with the distances to noise receptors to which it has committed in its maps and site plans.

CONCLUSION

The Project would impact receptors primarily during construction. This includes both residential and non-residential non-participating receptors within 2,000 feet of the Project Area. Common sources of construction noise include equipment, such as delivery trucks, backhoes, pile drivers, chain saws, bush hogs, or other large mowers for clearing, that produce maximum sound levels of up to approximately 80.6 to 89.6 dBA at 50 feet. Construction activities will occur over approximately 8 – 12 months between the hours of 7am and 7pm Monday through Saturday, although activities that create a higher level of noise, such as pile driving, will be limited to 8am – 5pm, Monday through Friday. Construction impacts would be temporary and intermittent, as most equipment would be phased in and out according to the progress of the Project. At times, construction activities will be audible to nearby residences or other sensitive receptors; however, not all equipment will be operating at the same time, and activities will be temporary in duration and spread throughout the Project area.

Pile driving during solar array installation is anticipated to produce the greatest sound level for an extended period (approximately six months). Standard solar pile drivers are estimated to produce approximately 80.6 to 89.6 dBA at 50 feet (Vermeer 2025). Pile driving may temporarily generate sound levels of approximately 70.4-79.4 dBA, depending on the equipment specifications, at the nearest receptor, a residence, but only for 1 or 2 days when the closest array is being installed; when other arrays are installed, the sound level would be lower. These sound levels represent a worst-case scenario; actual sound levels would likely be lower due to attenuation from vegetation and topography. Construction sounds at a solar project are comparable to other common construction activities that require pile driving due to their temporary and intermittent nature (MAREC 2021).

Overall, construction-related noise impacts would be temporary and intermittent, and would not contribute to a significant sound increase when compared to sound currently occurring on or

near the site (i.e., the operation of farming equipment for agricultural activities and crop harvesting as well as moderate traffic on the nearby roads).

During operation, the ambient sound environment would return to existing levels. The moving parts of the solar panel arrays would produce minimal sound. The transformer at the substation would not produce sound at level above the threshold for human hearing because of the relatively low level of sound it is expected to produce and the distance away of each receptor. In addition, nighttime operation will result in lower sound emissions, as power would not be generated and therefore the solar inverters and substation transformer will be operating in stand-by mode. As a result, impacts of Project operation are anticipated to be minimal to negligible.

Light truck vehicle noise from maintenance employees commuting to the site or driving on the site would be negligible in the context of existing local traffic levels and sounds. Maintenance activities such as periodic mowing of vegetation surrounding the solar panels would produce sound levels comparable to those of agricultural operations in and near the Project Area. Periodic mowing would produce sound levels comparable to roadway traffic in the surrounding area, although at less frequent intervals. The Applicant anticipates primarily using sheep and solar grazing to maintain vegetation, and therefore, the Project will generate less noise during vegetation management than the average solar project. As a result, impacts of Project maintenance are anticipated to be negligible.

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Appendix A

Equipment Specifications

CanadianSolar

TOPBiHiKu7

N-type Bifacial TOPCon Technology

690 W ~ 720 W

CS7N-690|695|700|705|710|715|720TB-AG



MORE POWER

- Module power up to 720 W
  Module efficiency up to 23.2 %
- Up to 85% Power Bifaciality,
  more power from the back side
- Excellent anti-LeTID & anti-PID performance.
  Low power degradation, high energy yield
- Lower temperature coefficient (Pmax): -0.29%/°C,
  increases energy yield in hot climate
- Lower LCOE & system cost

MORE RELIABLE

- Tested up to ice ball of 35 mm diameter
  according to IEC 61215 standard
- Minimizes micro-crack impacts
- Heavy snow load up to 5400 Pa,
  wind load up to 2400 Pa*

12 Years **Enhanced Product Warranty on Materials and Workmanship***

30 Years **Linear Power Performance Warranty***

1st year power degradation no more than 1%
Subsequent annual power degradation no more than 0.4%

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001: 2015 / Quality management system
ISO 14001: 2015 / Standards for environmental management system
ISO 45001: 2018 / International standards for occupational health & safety
IEC 62941: 2019 / Photovoltaic module manufacturing quality system

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730 / CE / INMETRO / MCS / UKCA / CGC
CEC listed (US California) / FSEC (US Florida)
UL 61730 / IEC 61701 / IEC 62716 / IEC 60068-2-68
UNI 9177 Reaction to Fire: Class 1 / Take-e-way

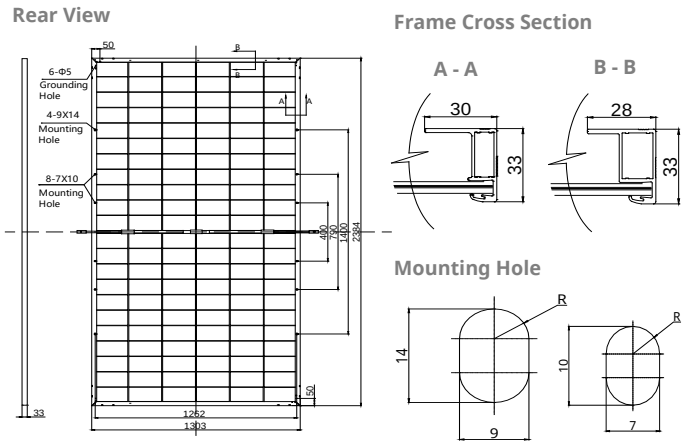
* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

CSI Solar Co., Ltd. is committed to providing high quality solar photovoltaic modules, solar energy and battery storage solutions to customers. The company was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey. Over the past 23 years, it has successfully delivered over 125 GW of premium-quality solar modules across the world.

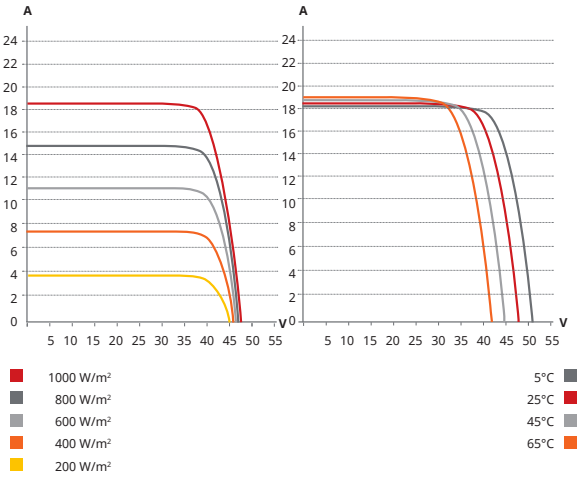
* For detailed information, please refer to the Installation Manual.

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ENGINEERING DRAWING (mm)



CS7N-695TB-AG / I-V CURVES



ELECTRICAL DATA | STC*

	Nominal Max. Power (Pmax)	Opt. Operating Voltage (Vmp)	Opt. Operating Current (Imp)	Open Circuit Voltage (Voc)	Short Circuit Current (Isc)	Module Efficiency
CS7N-690TB-AG	690 W	39.6 V	17.43 A	47.5 V	18.39 A	22.2%
Bifacial Gain** 5%	725 W	39.6 V	18.30 A	47.5 V	19.31 A	23.3%
Bifacial Gain** 10%	759 W	39.6 V	19.17 A	47.5 V	20.23 A	24.4%
Bifacial Gain** 20%	828 W	39.6 V	20.92 A	47.5 V	22.07 A	26.7%
CS7N-695TB-AG	695 W	39.8 V	17.47 A	47.7 V	18.44 A	22.4%
Bifacial Gain** 5%	730 W	39.8 V	18.34 A	47.7 V	19.36 A	23.5%
Bifacial Gain** 10%	765 W	39.8 V	19.22 A	47.7 V	20.28 A	24.6%
Bifacial Gain** 20%	834 W	39.8 V	20.96 A	47.7 V	22.13 A	26.8%
CS7N-700TB-AG	700 W	40.0 V	17.51 A	47.9 V	18.49 A	22.5%
Bifacial Gain** 5%	735 W	40.0 V	18.39 A	47.9 V	19.41 A	23.7%
Bifacial Gain** 10%	770 W	40.0 V	19.26 A	47.9 V	20.34 A	24.8%
Bifacial Gain** 20%	840 W	40.0 V	21.01 A	47.9 V	22.19 A	27.0%
CS7N-705TB-AG	705 W	40.2 V	17.55 A	48.1 V	18.54 A	22.7%
Bifacial Gain** 5%	740 W	40.2 V	18.43 A	48.1 V	19.47 A	23.8%
Bifacial Gain** 10%	776 W	40.2 V	19.31 A	48.1 V	20.39 A	25.0%
Bifacial Gain** 20%	846 W	40.2 V	21.06 A	48.1 V	22.25 A	27.2%
CS7N-710TB-AG	710 W	40.4 V	17.59 A	48.3 V	18.59 A	22.9%
Bifacial Gain** 5%	746 W	40.4 V	18.47 A	48.3 V	19.52 A	24.0%
Bifacial Gain** 10%	781 W	40.4 V	19.35 A	48.3 V	20.45 A	25.1%
Bifacial Gain** 20%	852 W	40.4 V	21.11 A	48.3 V	22.31 A	27.4%
CS7N-715TB-AG	715 W	40.6 V	17.63 A	48.5 V	18.64 A	23.0%
Bifacial Gain** 5%	751 W	40.6 V	18.51 A	48.5 V	19.57 A	24.2%
Bifacial Gain** 10%	787 W	40.6 V	19.39 A	48.5 V	20.50 A	25.3%
Bifacial Gain** 20%	858 W	40.6 V	21.16 A	48.5 V	22.37 A	27.6%
CS7N-720TB-AG	720 W	40.8 V	17.67 A	48.7 V	18.69 A	23.2%
Bifacial Gain** 5%	756 W	40.8 V	18.55 A	48.7 V	19.62 A	24.3%
Bifacial Gain** 10%	792 W	40.8 V	19.44 A	48.7 V	20.56 A	25.5%
Bifacial Gain** 20%	864 W	40.8 V	21.20 A	48.7 V	22.43 A	27.8%

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.
** Bifacial Gain: The additional gain from the back side compared to the power of the front side at the standard test condition. It depends on mounting (structure, height, tilt angle etc.) and albedo of the ground.

ELECTRICAL DATA | NMOT*

	Nominal Max. Power (Pmax)	Opt. Operating Voltage (Vmp)	Opt. Operating Current (Imp)	Open Circuit Voltage (Voc)	Short Circuit Current (Isc)
CS7N-690TB-AG	522 W	37.4 V	13.94 A	45.0 V	14.83 A
CS7N-695TB-AG	526 W	37.6 V	13.97 A	45.2 V	14.87 A
CS7N-700TB-AG	529 W	37.8 V	14.00 A	45.4 V	14.91 A
CS7N-705TB-AG	533 W	38.0 V	14.03 A	45.5 V	14.95 A
CS7N-710TB-AG	537 W	38.2 V	14.06 A	45.7 V	14.99 A
CS7N-715TB-AG	541 W	38.4 V	14.09 A	45.9 V	15.03 A
CS7N-720TB-AG	544 W	38.6 V	14.12 A	46.1 V	15.07 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m² spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

Specification	Data
Cell Type	TOPCon cells
Cell Arrangement	132 [2 x (11 x 6)]
Dimensions	2384 × 1303 × 33 mm (93.9 × 51.3 × 1.30 in)
Weight	37.8 kg (83.3 lbs)
Front Glass	2.0 mm heat strengthened glass with anti-reflective coating
Back Glass	2.0 mm heat strengthened glass
Frame	Anodized aluminium alloy
J-Box	IP68, 3 bypass diodes
Cable	4.0 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	360 mm (14.2 in) (+) / 200 mm (7.9 in) (-) or customized length*
Connector	T6 or MC4-EVO2 or MC4-EVO2A
Per Pallet	33 pieces
Per Container (40' HQ)	594 pieces or 495 pieces (only for US & Canada)

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

ELECTRICAL DATA

Operating Temperature	-40°C ~ +85°C
Max. System Voltage	1500 V (IEC/UL)
Module Fire Performance	TYPE 29 (UL 61730) or CLASS C (IEC61730)
Max. Series Fuse Rating	35 A
Protection Class	Class II
Power Tolerance	0 ~ + 10 W
Power Bifaciality*	80 %

* Power Bifaciality = $Pmax_{rear}$ / $Pmax_{front}$, both $Pmax_{rear}$ and $Pmax_{front}$ are tested under STC, Bifaciality Tolerance: ± 5 %

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.29 % / °C
Temperature Coefficient (Voc)	-0.25 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	41 ± 3°C

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice.
Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

PARTNER SECTION

CSI Solar Co., Ltd.
199 Lushan Road, SND, Suzhou, Jiangsu, China, 215129, www.csisolar.com, support@csisolar.com

July 2024. All rights reserved, PV Module Product Datasheet V1.8_EN

SG4400UD-MV-US

Turnkey Station for 1500 Vdc System MV Transformer Integrated



HIGH YIELD

- Advanced three-level technology, max. inverter efficiency 98.9 %
- Full power operation at 40 ℃ (104 ℉)
- Effective cooling, wide operation temperature

EASY O&M

- Integrated current, voltage and MV parameters monitoring function for online analysis and trouble shooting
- Modular design, easy for maintenance

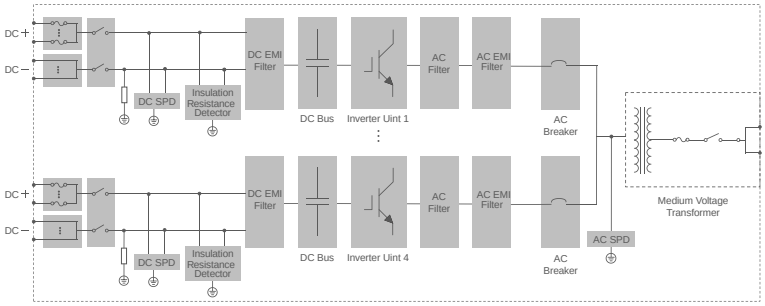
SAVED INVESTMENT

- Low transportation and installation cost due to 20-foot container size design
- DC 1500V system, low system cost
- Integrated MV transformer and LV auxiliary power supply
- Q at night optional

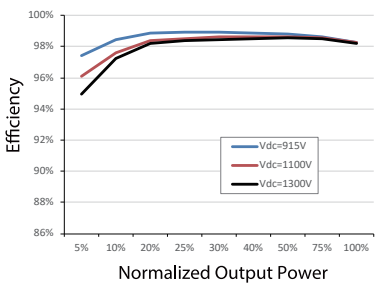
GRID SUPPORT

- Compliance with standards:UL 1741,UL 1741 SA/SB, IEEE 1547, Rule 21 and NEC code
- Low / High voltage ride through (L/HVRT), L/HFRT, soft start / stop
- Active & reactive power control and power ramp rate control

CIRCUIT DIAGRAM



EFFICIENCY CURVE



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SUNGROW
Clean power for all

Type Designation	SG4400UD-MV-US
Input (DC)	
Max. PV input voltage	1500 V
Min. PV input voltage / Start-up input voltage	915 V / 955 V
Available DC fuse sizes	250 A, 315 A, 400A, 450 A, 500 A, 630 A
MPP voltage range	915 V – 1500 V
Full power MPP voltage range@40℃	915 V - 1337 V*
No. of independent MPP inputs	4
No. of DC inputs	28 inputs negative grounding (optional: 24 inputs floating)
Max. PV input current	4 * 1226 A
Max. DC short-circuit current	4 * 3528 A
PV array configuration	Negative grounding or floating
Output (AC)	
AC output power	4400 kVA @ 40 ℃ (104 ℉) ** (Optional: 4400 kVA @ 45 ℃(113 ℉)) **
Nominal grid frequency / Grid frequency range	60 Hz / 57 Hz – 63 Hz
Harmonic THD	< 3 % (at nominal power)
Power factor at nominal power / Ajustable power factor	> 0.99 / 0.8 leading - 0.8 lagging
Efficiency	
Inverter Max. efficiency	98.9 %
Inverter CEC efficiency	98.5 %
Transformer	
Transformer rated power	4400 kVA
Transformer Max. power	4400 kVA
LV / MV voltage	0.645 kV / 34.5 kV
Transformer vector	Dy 1 (Optional: Dy 11, Yny 0)
Transformer cooling type	KNAN (Optional: ONAN)
Protection	
DC input protection	Load switch + fuse
Inverter output protection	Circuit breaker
AC MV output protection	Load switch + fuse
Surge protection	DC Type II / AC Type II
Grid monitoring / Ground fault monitoring	Yes / Yes
Insulation monitoring	Yes
Overheat protection	Yes
General Data	
Dimensions (W * H * D)	6058 mm * 2896 mm * 2438 mm 238.5'' * 114.0'' * 96.0''
Weight	≤ 36376 lbs
Degree of protection	NEMA 4X (Electronic for Inverter) / NEMA 3R (Others)
Auxiliary power supply	5 kVA, 120 Vac ; Optional : 35 kVA 480 Vac + 5 kVA 120 Vac
Operating ambient temperature range (It refers to the inverter only and the ambient temperature is 1m around the inverter.)	-35 ℃ - 60 ℃ (> 45 ℃ derating) / optional: -40 ℃ - 60 ℃ (> 45 ℃ derating) -31 ℉ - 140 ℉ (> 113 ℉ derating) / optional: -40 ℉ - 140 ℉ (> 113 ℉ derating)
Allowable relative humidity range	0 % - 100 %
Cooling method	Temperature controlled forced air cooling
Max. Operating altitude	1000 m (Standard) / > 1000 m (Customized) (3280.8 ft (Standard) / > 3280.8 ft (Customized))
Display	LED Indicators , WLAN + WebHMI
Night reactive power function	Optional
DC-Coupled storage interface	Optional
Charging power from the grid	Optional
Communication	Standard: RS485, Ethernet;
Compliance	UL1741, UL62109-1,CSA C22.2 No.107.1-16, IEEE1547-2018, IEEE1547.1-2020, UL1741 SA/SB, California Rule21, HECO SRD V2.0, NEC 2020,PRC-024
Grid support	Q at night function (optional), L/HVRT, L/HFRT, Active & reactive power control and power ramp rate control, Volt-var, Frequency-watt

*Full power MPP range is temperature dependent, check the characteristic curve of the inverter for more information.
**For sustained operation above 40°C, an optional 60 °C temperature rise transformer is recommended.

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PD10 Pile Driver

Operator's and Maintenance Manual



EN_o-m2_10 original instructions
Publication Date: 2025-05-06
Serial No. 1001 -
Order No. 105400CQ3
Cabled Assembly No. 296379241

Vermeer® | EQUIPPED TO DO MORE.™

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Introduction

The Operator's and Maintenance Manuals explain the proper operation and maintenance of your machine. Study and understand these instructions thoroughly before operating or maintaining your machine.

Do not attempt any maintenance procedures unless they are fully understood and can be safely and accurately performed with the available tools and equipment. Failure to do so could result in personal injury or equipment damage. If you do not understand the instructions in these manuals or need additional information, contact your Vermeer dealer.

The maintenance intervals are based on normal operating conditions. When operating under severe conditions, the maintenance intervals should be more frequent.

Instructions, illustrations, and specifications in these manuals are based on the latest information available at the time of publication. Your machine may have product improvements, options, or features not yet contained in these manuals.

To provide a better view, some photographs or illustrations may show the machine shields removed. **Never operate the machine with shields removed - keep all shields in place**. If removing a shield is necessary, return it to its correct position before operating the machine.

Access to, and use of any software installed on the machine is subject to the Master Software License and Terms of Use for Vermeer Productivity Tools. For additional information, contact your Vermeer dealer.

Two Operator's and one Maintenance Manual are provided with each machine. The tethered (cabled) manual must remain attached to the machine for immediate reference; store the second manual in a safe location. The Maintenance Manual should also be kept on the machine and referenced for all lubrication and maintenance procedures. When not in use, manuals should be kept in the manual storage box.

To order additional copies of the Manuals and the Operation and Safety Video (if available) from your dealer, use the reorder number on the front cover. Copies are also available in Spanish from your dealer. Other languages may also be available.

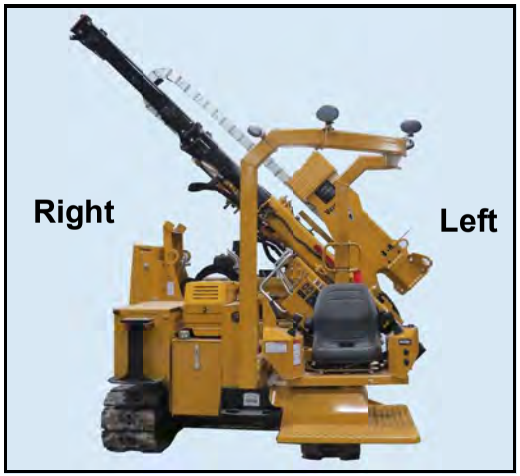
Vermeer Corporation reserves the right to make changes at any time without notice or obligation.

Su distribuidor dispone de ejemplares en español de este manual.

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Notice to Owner

Replacement manuals are free of charge by registering your **used** Vermeer machine. Your machine's Operator's, Maintenance, and Parts Manuals may be available online at www.myvermeer.com. For questions about online or printed manuals, or to register a used machine, contact the data analytics department by telephone: 800-829-0051 or 641-628-3141; email: dataanalytics@vermeer.com; internet: www.vermeer.com or www.myvermeer.com; or letter: Data Analytics Department, Vermeer Corporation, P.O. Box 200, Pella IA 50219 USA.



Orientation: Right and left sides of the machine are determined by direction of forward travel in transport position as shown.

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Trademarks

Vermeer, the Vermeer logo, and Equipped to Do More are trademarks of Vermeer Manufacturing Company in the U.S. and/or other countries
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Vermeer New Industrial Equipment Limited Warranty

Effective November 1, 2021 **Warranty period: 12 months / 1000 hours**

Vermeer Corporation (hereinafter "Vermeer") warrants each new Industrial product of Vermeer's manufacture to be free from defects in material and workmanship, under normal use and service for one (1) full year after initial purchase/retail sale or 1000 operating hours, whichever occurs first. This Limited Warranty shall apply only to complete machines of Vermeer's manufacture, parts are covered by a separate Limited Warranty. **EQUIPMENT AND ACCESSORIES NOT OF VERMEER'S MANUFACTURE ARE WARRANTED ONLY TO THE EXTENT OF THE ORIGINAL MANUFACTURER'S WARRANTY AND SUBJECT TO THEIR ALLOWANCE TO VERMEER ONLY IF FOUND DEFECTIVE BY SUCH MANUFACTURER.**

EXTENDED WARRANTY OPTIONS ARE AVAILABLE FOR PURCHASE

WARRANTY TERMS During the Limited Warranty period specified above, any defect in material or workmanship in any warranted item of Vermeer Industrial Equipment not excluded below shall be repaired or replaced at Vermeer's option without charge by any authorized independent Vermeer dealer. The warranty repair or replacement must be made by a Vermeer independent authorized dealer at the dealer's location. Vermeer will pay for replacement parts and such authorized dealer's labor in accordance with Vermeer's labor reimbursement policy. Vermeer reserves the right to supply remanufactured replacement parts as it deems appropriate.

RETAIL PURCHASER RESPONSIBILITY: This Limited Warranty requires proper maintenance and periodic inspections of the Industrial Equipment as indicated in the Operator's/Maintenance Manual furnished with each new Industrial Equipment. The cost of routine or required maintenance and services is the responsibility of the retail purchaser. The retail purchaser is required to keep documented evidence that these services were performed. This Vermeer New Industrial Equipment Limited Warranty may be subject to cancellation if the above requirements are not performed. Vermeer Industrial Equipment with known failed or defective parts must be immediately removed from service.

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EXCLUSIONS AND LIMITATIONS

The warranties contained herein shall **NOT APPLY TO:**

(1) Any defect which was caused (in Vermeer's sole judgment) by other than normal use and service of the Industrial Equipment, or by any of the following; (i) accident (ii) misuse or negligence (iii) overloading (iv) lack of reasonable and proper maintenance (v) improper repair or installation (vi) unsuitable storage (vii) non-Vermeer approved alteration or modification (viii) natural calamities (ix) vandalism (x) parts or accessories installed on Industrial Equipment which were not manufactured or installed by Vermeer authorized dealers (xi) the elements (xii) collision or other accident.

(2) Any Industrial Equipment whose identification numbers or marks have been altered or removed or whose hour meter has been altered or tampered with.

(3) Any Industrial Equipment which any of the required or recommended periodic inspection or services have been performed using parts not manufactured or supplied by Vermeer or meeting Vermeer Specifications including, but without limitation, engine tune-up parts, engine oil filters, air filters, hydraulic oil filters, and fuel filters.

(4) New Industrial Equipment delivered to the retail purchaser in which the equipment/warranty registration has not been completed and returned to Vermeer within ten (10) days from the date of purchase.

(5) Any defect which was caused (in Vermeer's sole judgment) by operation of the Industrial Equipment not abiding by standard operating procedures outlined in the Operator's Manual.

(6) Engine, battery, and tire Limited Warranties and support are the responsibility of the respective product's manufacturer.

(7) Transportation costs, if any, of transporting to the Vermeer dealer. Freight costs, if any, of transporting replacement parts to the Vermeer dealer.

(8) The travel time of the Vermeer dealer's service personnel to make a repair on the retail purchaser's site or other location.

(9) In no event shall Vermeer's liability exceed the purchase price of the product,

(10) Vermeer shall not be liable to any person under any circumstances for any incidental or consequential damages (including but not limited to, loss of profits, out of service time) occurring for any reason at any time.

(11) Diagnostic and overtime labor premiums are not covered under this Limited Warranty Policy. Oils and fluids are not covered under this Limited Warranty.

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(12) Depreciation damage caused by normal wear, lack of reasonable and proper maintenance, failure to follow operating instructions, misuse, lack of proper protection during storage.
(13) Accessory systems and electronics not of Vermeer's manufacture are warranted only to the extent of such manufacturer's respective Limited Warranty if any.
(14) Down hole toolage is not covered under this warranty.
(15) Wear items which are listed below:

antenna, augers, base plates, bearing seals, bearings, belts, brake pads, brushes, bolts/torqued parts, boom wear items, booms, brake pads, bushings, buckets, cable fingers, chain, clamping vise parts, clutches, clutch components, conveyor belts, cups, curtains, cutter wheels, dies, digging chain, digging rims, discharge conveyor belts, drive chuck, drums, earth stakes, end idler, end rollers, fan belts, flails, flashings, hammers, hoses, infeed conveyor belts, infeed conveyor chains, jaws, knives, leaf chain, lights, lights on light kits, liners, outer drum bearings, packing assemblies, pins and bushings, pins and pivot points, piston cups, pivot rings, plastic wear strips, plow blades, plungers, pockets, rods, rollers, rod loader parts, rooter bands, rotor plates, rubber grouser bars, rubber or plastic items, rubber tracks, rubber track bands, rubber shielding, scraper knives, screens, seals, service items, shear bar/bedknife, skid shoes, sprockets, teeth, tips, tip mounts, tires, thrust wheels, tooling, track chain, track guides, track idlers, track pads, track rollers, track sprockets, trench cleaner (crumber), trip cleaners, trommel brushes, trommel screen panels, trunnion and pivot points, valves, valve seats, water hoses, water swivels, wear bars, wear blocks, wear plates, wear strips, wheels, winch cable, windshield wiper parts.

PARTS WARRANTY:

Parts replaced in the warranty period will receive the balance of the first year New Industrial Equipment Limited Warranty, during the first (12) months or 1000 hours, whichever comes first. Replacement parts after the original machine warranty, are warranted to be free from defects of material for ninety (90) days or the part will be repaired or replaced, without labor coverage for removal and reinstallation.

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EXCLUSIONS OF WARRANTIES: EXCEPT FOR THE WARRANTIES EXPRESSLY AND SPECIFICALLY MADE HEREIN, VERMEER MAKES NO OTHER WARRANTIES, AND ANY POSSIBLE LIABILITY OF VERMEER HEREINUNDER IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. VERMEER RESERVES THE RIGHT TO MODIFY, ALTER AND IMPROVE ANY PRODUCT WITHOUT INCURRING ANY OBLIGATION TO REPLACE ANY PRODUCT PREVIOUSLY SOLD WITH SUCH MODIFICATION. NO PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY, OR TO ASSUME ANY ADDITIONAL OBLIGATION ON VERMEER'S BEHALF.

NO DEALER WARRANTY. The selling dealer makes no warranty of its own and the dealer has no authority to make any representation or promise on behalf of Vermeer or to modify the terms or limitations of this warranty in any way.

ELECTRONIC SIGNATURES. Each of the parties hereto expressly agrees to conduct transactions by electronic means. Accordingly, the parties agree and intend that all electronic transmissions including, without limitation, electronic signatures, shall be considered equivalent to an original writing as provided under Iowa law, as it may be amended from time to time.

MANUFACTURED BY:
VERMEER CORPORATION
1210 Vermeer Road East, P.O. Box 200
Pella, Iowa 50219-0200 USA

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Telematics Equipment Notice and Consent

This machine may be equipped with Vermeer GPS tracking equipment that collects and transmits data about the machine's performance and location. This data is collected by Vermeer and held, used and shared consistently with the terms of the Vermeer Privacy Policy and any applicable provisions of the End User License Agreement ("EULA") which may be found at: http://www2.vermeer.com/vermeer/NA/en/N/privacy and http://telematics.vermeer.com.

Machine owner and designated representatives ("subscribers") may access the data through a subscription based website called Vermeer Telematics (formerly known as Vermeer Fleet/Fleet Edge). Use of Vermeer Telematics is subject to the subscriber's acceptance of the terms and conditions of use and payment of any applicable subscription or license fees. If you are a current subscriber, you may obtain a copy of the currently effective terms and conditions through your login or by contacting appsupport@vermeer.com.

More information about Vermeer Telematics may be found at: http://store.vermeer.com.

Machine owner may opt-out of the telematics service and collection of data by Vermeer Telematics at any time by contacting your Vermeer dealer or appsupport@vermeer.com.

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Receiving and Delivery Report

Dealer Prep

Check or perform the following:

General

___ Check for shipping damage or shortage.
___ Check that Operator's Manual is attached to the machine.
___ Check for correct lubrication.
___ Check bolts for tightness.
___ Check installation and condition of all shields.
___ Check condition of all safety signs and operation decals.
___ Check seat belt installation and operation. Refer to *page 60-29.*
___ Check operation of neutral start interlock system. Refer to *page 60-25.*
___ Check operation of operator presence system. Refer to *page 60-27.*
___ Check track tension. Refer to *page 60-63.*
___ Check operation of instruments and lights. Refer to *page 20-2.*
___ Check all phases of operation. Refer to *page 20-2.*

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Engine

___ Check oil level in engine.
___ Check level and concentration of coolant.
___ Check condition of air cleaner.
___ Check battery electrolyte level and charge.
___ Check air intake clamps.
___ Check radiator hose clamps.
___ Check belts for correct tension. Refer to Engine Manufacturer Operator's Manual.
___ Check operation of engine.

Hydraulics

___ Check hydraulic fluid level.
___ Check all hydraulic components for leaks or damage.
___ Check controls for correct function. Refer to *page 20-1.*

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Delivery

Check and perform the following with the customer:

___ Review contents of the HDD Resource Library.
___ Review the DVD on Horizontal Directional Drilling.
___ Review all sections of the operator's manual.
___ Review welding alert and location of electronic modules to unplug. Refer to *page 60-2.*
___ Grease or oil all lubrication points.

Review and demonstrate with the customer the various aspects of pile driver operation:

___ Overall explanation of how the pile driver works.
___ Pile driver safety.
___ Preparing the pile driver for operation. Refer to *page 40-1.*

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Dealer/Owner Information

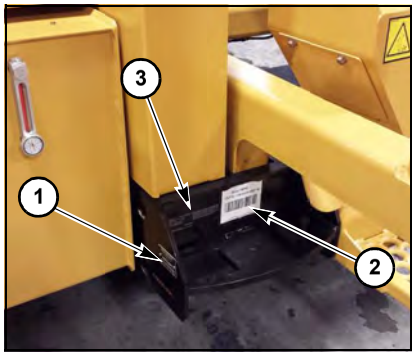
dealer	owner
address	address
city	city
state/province	state/province
zip/postal code	zip/postal code
country	country
phone number	phone number
email address	email address

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Identification Numbers – Record

Machine Model Number **(1)** _____

Machine Serial Number **(1)** _____



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Machine Identification Decal

This decal **(2)** contains a barcode with the machine's vehicle identification number (VIN). It can be scanned with any barcode reading device.

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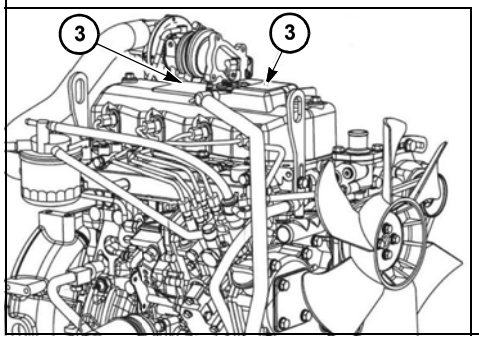
Engine Identification Numbers – Record

Engine Identification tags **(3)** are located on top of engine and next to machine identification decal.

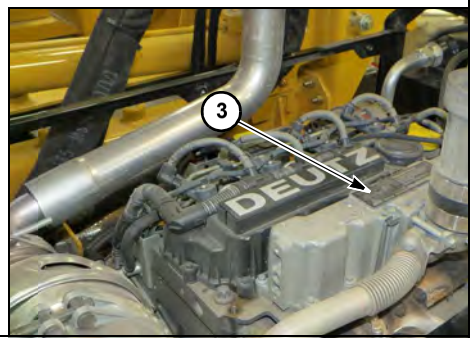
Engine Model Number
_____

Engine Serial Number _____

Yanmar engine



Deutz engine



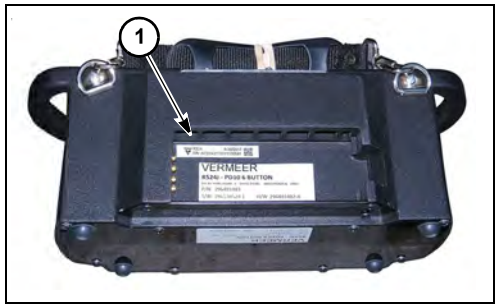
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Remote Control Identification Numbers – Record

Remove battery pack to view remote control identification numbers.

Remote Control Model Number **(1)** _____

Remote Control Serial Number **(1)** _____



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Section 10: Safety Messages

General safety messages are in this Safety Messages section. Specific safety messages are located in appropriate sections of the manual where a potential hazard may occur if the instructions or procedures are not followed.

A signal word **DANGER**, **WARNING**, or **CAUTION** is used with the safety alert symbol.

Safety signs with signal word **DANGER**, **WARNING**, or **CAUTION** are located near specific hazards.

DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information considered important, but not hazard-related.

Safety Symbol Explanation



This is the safety alert symbol. This symbol is used in combination with an exclamation mark or other symbols to alert you to the potential for death or serious injury.

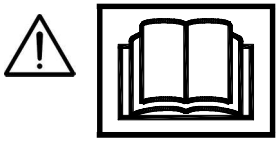


This symbol indicates that at least one part of the machine is not operating correctly.
Shutting down the machine may not be necessary, but some maintenance may be required.

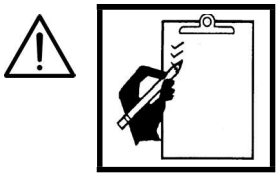
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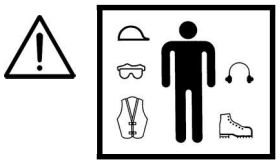
WARNING: Read Operator's Manual and safety signs, and watch the operations and safety video, before operating machine.



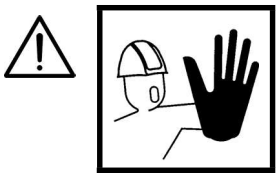
WARNING: Read Operator's Manual and safety signs before operating machine.



WARNING: Check machine before operating. Machine must be in good operating condition and all safety equipment installed and functioning correctly.

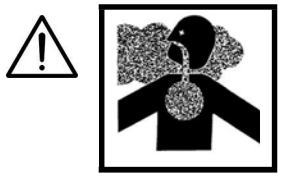


WARNING: Wear personal protective equipment. Wear close-fitting clothing and confine long hair. Additional personal protection requirements are explained separately. Refer to "Personal Protection," *page 40-5*.

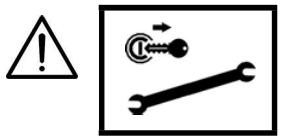


WARNING: Keep all spectators away.

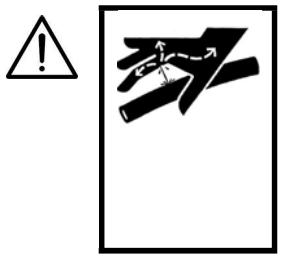
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WARNING: Engine exhaust can asphyxiate or poison resulting in death or serious injury. Operate machine outdoors. If it is necessary to operate engine in an enclosed area, properly vent exhaust gases.

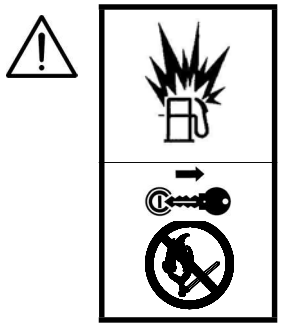


WARNING: Failure to use shutdown procedure can result in unexpected hazard(s). Death or serious injury could result due to entanglement, crushing, cutting, or other hazardous contact. Follow Shutdown Procedure after operating, before performing any service or maintenance, and before transporting. Refer to *Shutdown Procedure, page 23-1*.



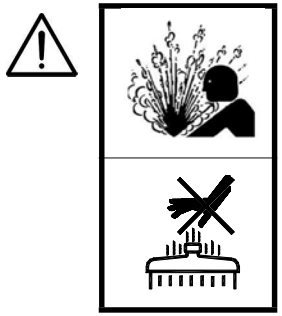
WARNING: Pressurized fluid can penetrate body tissue and result in death or serious injury. Leaks can be invisible. Keep away from any suspected leak. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing any other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

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WARNING: Fuel and fumes can explode and burn.

Shut off engine before refueling. No flame. No smoking.



WARNING: Hot fluid under pressure can scald.

Allow engine to cool before opening radiator cap.

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WARNING: Do not use the hammer to lift people.

WARNING: Make no modifications to your equipment unless specifically recommended or requested by Vermeer Corporation.

WARNING: Be sure that all safety devices, including shields, are installed and functioning correctly after servicing the machine.

WARNING: Failure to follow any of the preceding safety instructions or those that follow within this manual, could result in death or serious injury. This machine is to be used only for those purposes for which it was intended as explained in the Operator's Manual.

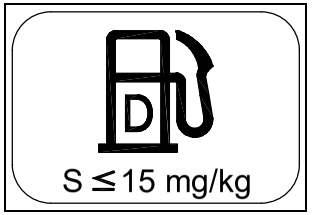
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Section 12: Diesel Fuel Recommendations

Diesel Fuel – Sulfur Content

Tier 4 engines require Ultra Low Sulfur Diesel (ULSD) fuel, with sulfur content less than 15 ppm (15 mg/kg). Use of fuels other than what is specified in the engine manual will impact engine performance, damage engine emissions systems and may result in engine and exhaust system warranty being voided.



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Section 15: Intended Use

The PD10 Pile Driver is a self-propelled machine designed to drive metal piles or posts into the ground.

Always use this machine in accordance with the instructions contained in this manual, on safety signs on the machine, and in other materials provided by Vermeer Corporation.

Proper maintenance and repair are essential for safe and efficient machine operation. Do not use the machine if it is not in suitable operating condition.

In addition, ensure new operator is familiar with all the safety signs and control operations.

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Section 16: Vermeer Productivity Tools

Vermeer GPS Tracking Equipment (Telematics)

- Serial numbers 1001 – 3000 may be equipped with Vermeer GPS tracking equipment.
- Serial numbers 3001 and up are equipped with Vermeer GPS tracking equipment.

Vermeer uses GPS tracking equipment to collect data about the machine's performance and location. When activated, the telematics control unit (TCU) transmits the data to a subscription-based website called Vermeer Telematics (formerly known as Vermeer Fleet/Fleet Edge). Subscribers can access the data through a computer or mobile device.

Each subscription is valid for a current registered owner's specific machine. The subscription cannot be transferred to another machine or to a new machine owner.

- After subscribing, go to http://telematics.vermeer.com and refer to the bulletin for instructions on accessing the user's guides.
- Subscriptions can be canceled at any time by contacting your local Vermeer dealer or emailing appsupport@vermeer.com.
- Subscribers must notify appsupport@vermeer.com to cancel a subscription when selling a machine.

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There are two levels of data access, as well as a third option which turns off the system.

- Full Implementation – The subscription owner, Vermeer, and authorized dealers can all access the data. A new machine, manufactured by Vermeer Corporation and equipped with telematics, automatically begins transmitting data to Vermeer and its authorized dealer. The owner must activate the subscription to access the data. For more information on subscribing, contact your Vermeer dealer or email appsupport@vermeer.com
- Partial Implementation – Only the registered owner and Vermeer Corporation can access the data. To select this option, contact your dealer or email appsupport@vermeer.com.
- Shut System Off – To discontinue data collection and turn off the system, email appsupport@vermeer.com.

Used Machines – to activate machine telematics after purchasing a used machine:

Step 1: View the compatible machine list online at http://store.vermeer.com, or contact your local Vermeer dealer or email appsupport@vermeer.com to determine if machine telematics is available for installation.

Step 2: Contact your dealer or email appsupport@vermeer.com to ensure that any previous subscription related to your machine has been canceled.

For more information, contact your Vermeer dealer or email appsupport@vermeer.com.

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Section 20: Controls

Optional Remote Control

Operations of the remote control **(1)** are detailed in the remote-control section of this manual. Refer to “Optional Remote Control,” *page 21-1.*

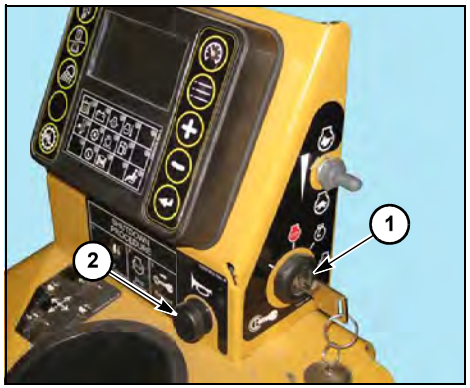
The remote control is stored inside the toolbox. Refer to “Access – Storage For Optional Remote Control,” *page 20-21.*



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Engine Controls

(1) *Keyswitch*





Counterclockwise . . . . . .not used



Vertical position . . . . . **off**



First position clockwise . . . . . **run/electrical system on**



Second position clockwise . . . . . **start**

Release key immediately after engine starts.

If either transport or operation controls are out of neutral, engine will start but machine will not function. Screen will show “RESET” *left joystick* or *reset right joystick*.

(2) *Horn*



Press . . . . . **horn sounds**

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(3) *Throttle switch*



Push up . . . . . **increase rpm**





Push down . . . . . **decrease rpm**



(4) *Battery disconnect switch*

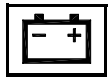


Rotate key **counterclockwise** . . . . . **disconnect ground**

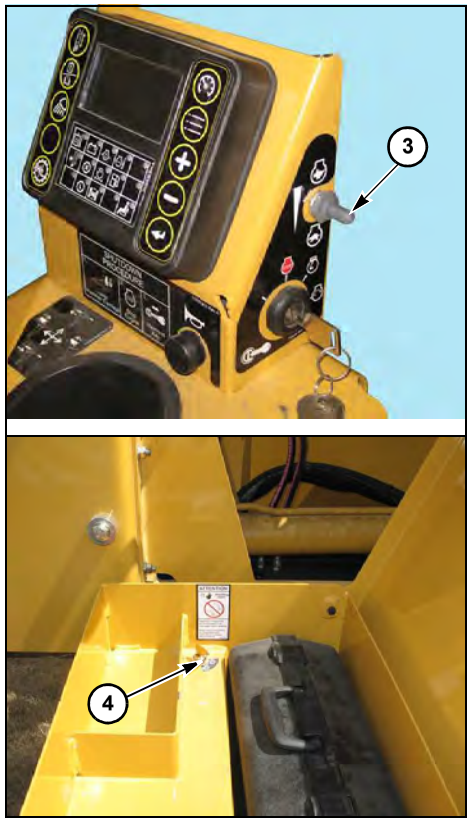




Rotate key **clockwise** . . . . . **connect ground**



NOTICE: Do not disconnect battery power with *keyswitch* on. Damage to controller could result.



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Controller Keys

(1) *Measure mode key*
Press to toggle through the following measure modes:

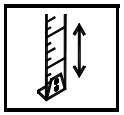
- Manual
- Laser elevation (option)
- Laser elevation with GPS X/Y (option)
- GPS X/Y (option)
- GPS X/Y/Z (option)

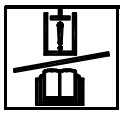
(2) *Valve reset key*
Press. . . . . **reset control valve and clear valve faults**

(3) *Work lights key*
Press. . . . . **turn work lights on/off**

(4) *Ground drive speed key*
Press. . . . . **toggle between high and low ground drive speeds**

(5) *Engine key*
Press. . . . . **toggle between main screen and engine screen**
Refer to “Controller Screens,” *page 20-24.*













Keys 5, 6, 7, 8, and 9 are always available regardless of whether remote control or operator’s station is active.

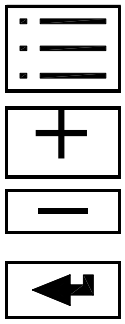
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(6) *Menu key*
Press . . . . . **access menu**
Also, press to back out of a selection without saving.

(7) *Increase key*
Press . . . . . **scroll up through screens or to increase values**

(8) *Decrease key*
Press . . . . . **scroll down through screens or to decrease values**

(9) *Enter key*
Press . . . . . **select screen items or to save values**

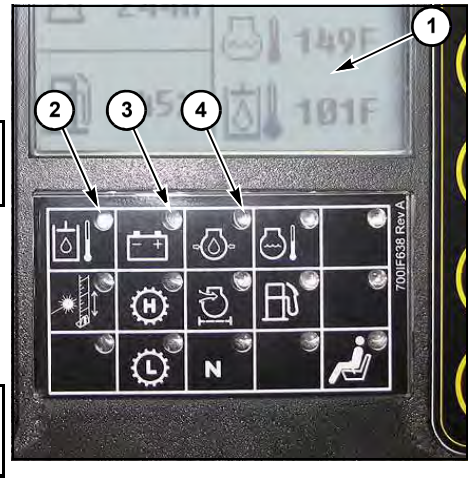




Keys 5, 6, 7, 8, and 9 are always available regardless of whether remote control or operator's station is active.

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Machine Monitor Lights



(1) Display

(2) Hydraulic fluid high temperature indicator (red)
Red light comes on when hydraulic oil temperature reaches 190°F (88°C) and indicates that oil temperature is getting too high. Follow *Shutdown Procedure,* page *23-1.* Check fan belt for wear. Make sure cooler is not blocked and intake screens are clean.

If temperature exceeds 200°F (93°C) for 30 seconds, a hydraulic temperature high fault will be shown on display and an engine shutdown will occur.

(3) Alternator indicator (red)
Indicates (depending on engine option) alternator is not charging correctly, or ignition switch is on and engine is not running.

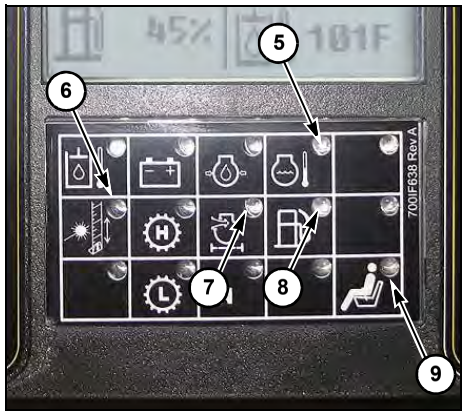
Indicates low or high voltage while engine is running.

(4) Low engine oil pressure indicator light (red)
A light comes on:

Deutz: When oil pressure falls below an acceptable minimum, with the engine running and the condition lasts for more than 12 seconds, the engine will shut down. Engine restart and run is allowed for up to 10 seconds to move machine if needed. This restart may be done multiple times.

Yanmar: When oil pressure is too low. If light comes on while engine is running, or if light does not shut off within 15 seconds after starting engine, follow *Shutdown Procedure* and correct the issue. Refer to *page 23-1.* After 15 seconds, the engine will shut down automatically if oil pressure indicator light is on for a continuous five seconds.

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(5) Engine coolant temperature indicator (red)
Light comes on when temperature reaches 230°F (110°C).

If temperature continues to rise, the engine will derate to avoid excessive temperature. If coolant exceeds 246°F (119°C) for 10 seconds, the engine will shut down. Engine restart and run is allowed for up to 10 seconds to move machine if needed. This restart may be done multiple times.

(6) Laser elevation (option) (green)
Indicates use of laser elevation has been enabled.

(7) Air restriction indicator (amber)
Indicates air filter is dirty.

(8) Low fuel indicator (amber)
Indicates less than 10% of fuel capacity remains.
Display also shows fuel remaining, in amount as a percent of capacity.

(9) Operator presence system engaged (green)
Light comes on when operator is in seat and key is on.

Light will flash for three seconds after operator leaves seat and then turns off. All engaged functions will stop.

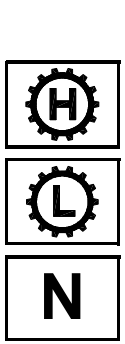
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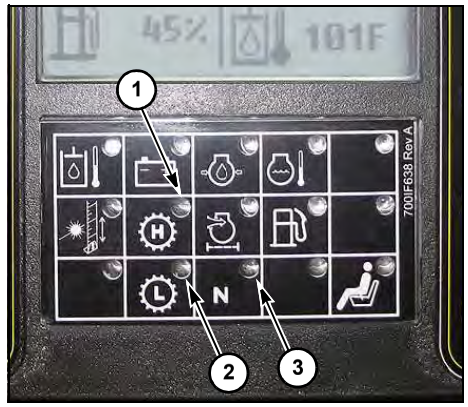
Ground Drive Indicator Lights

(1) Ground drive high (green)

(2) Ground drive low (green)

(3) Neutral (green)
Indicates joysticks and ground drive are in neutral. If any control is out of neutral, light goes out.
Hammer float switch does not turn light off.





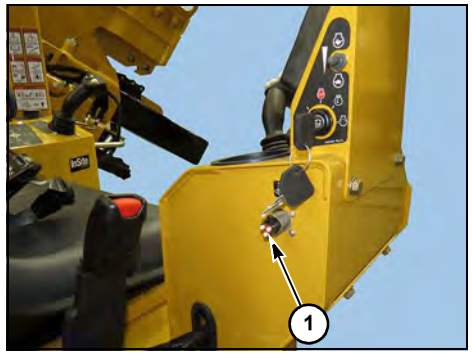
Park Brake

Park brake automatically comes on if ground drive is in neutral or if engine is off.

Diagnostic Port

Plug in laptop at port **(1)** to diagnose error messages.





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Operator's Station Controls

(1) *Operator presence switch*

(2) *Seat slide lever*

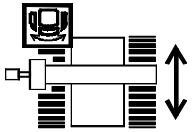
(3) Electrical accessory outlets

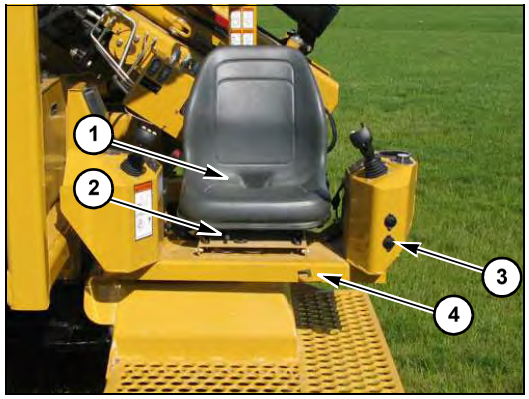
(4) *Operator's station pivot lever*

Transport Mode Position

When sitting in seat, use lever **(4)** to rotate seat to the right.

Transport mode position is used for moving machine when it is not in work mode. Hydraulic hammer, hammer float, auto plumb, auto home, and auto target functions are locked out in this position. All *right joystick* functions are locked out when ground drive is engaged. Backup alarm is active.





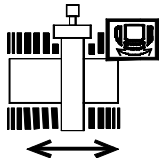
Transport Mode Position

Work Mode Position

When sitting in seat, use lever **(4)** to rotate seat to the left.

Work mode position is used for operating the hammer. All machine functions are available in work position.

Backup alarm is not active.

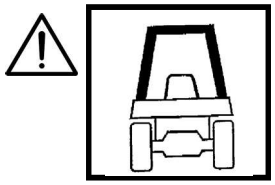




Work Mode Position

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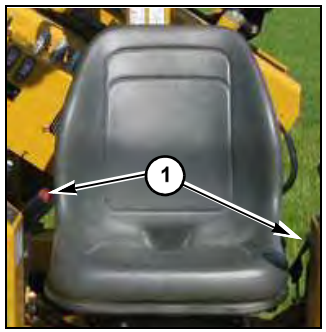
Seat Belt



WARNING: The rollover protection structure (ROPS) is intended to protect the tractor operator in the event of a rollover. In order for you to be protected by the ROPS, you must wear seat belts. Follow instructions below relating to ROPS safety precautions.

Seat belt **(1)** must be worn at all times while operating the machine from the seated controls. To fasten seat belt, extend belt and snap it into belt clasp. Ensure all slack is out of the belt. Seat belt must be snug but not tight.

To unfasten seat belt, press red release button on belt clasp.



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Operator Presence Switch

The operator presence system uses a switch in the seat **(1)** to detect the presence of an operator. The operator must be seated for the functions to operate.

If the operator leaves the seat while a function is operating, the function will stop within three seconds. All controls must be returned to neutral before any function can be resumed.

The operator presence system is intended for your safety and must be maintained in good functional condition. Contact your Vermeer dealer if it does not function properly.



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Ground Drive Controls (Left Joystick)

Machine moves in direction of left joystick movement.

Work Mode

Shown on machine in yellow.

When sitting in seat, use *operator's station pivot lever* to rotate seat to the left.

(1) Move joystick ahead and left

(2) Move joystick straight ahead from neutral to counter-rotate counterclockwise

(3) Move joystick ahead and right

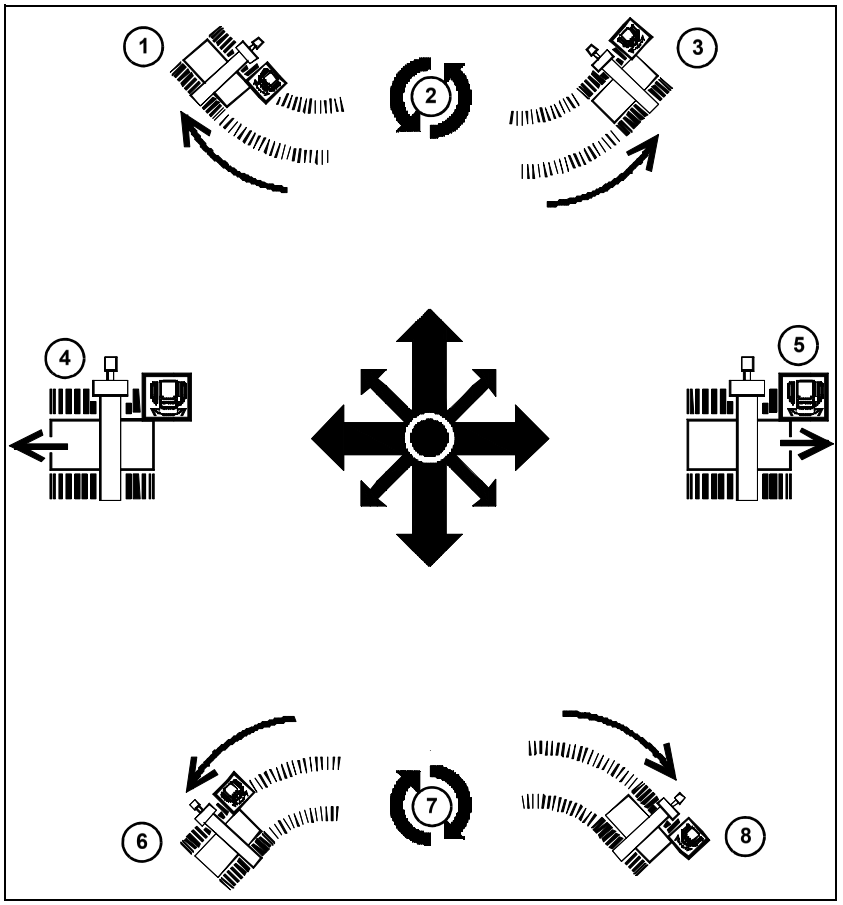
(4) Move joystick left

(5) Move joystick right

(6) Move joystick back and left

(7) Move joystick straight back from neutral to counter-rotate clockwise

(8) Move joystick back and right



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Transport Mode

Shown on machine in white.

When sitting in seat, use *operator's station pivot lever* to rotate seat to the right.

(1) Move joystick ahead and left

(2) Move joystick ahead

(3) Move joystick ahead and right

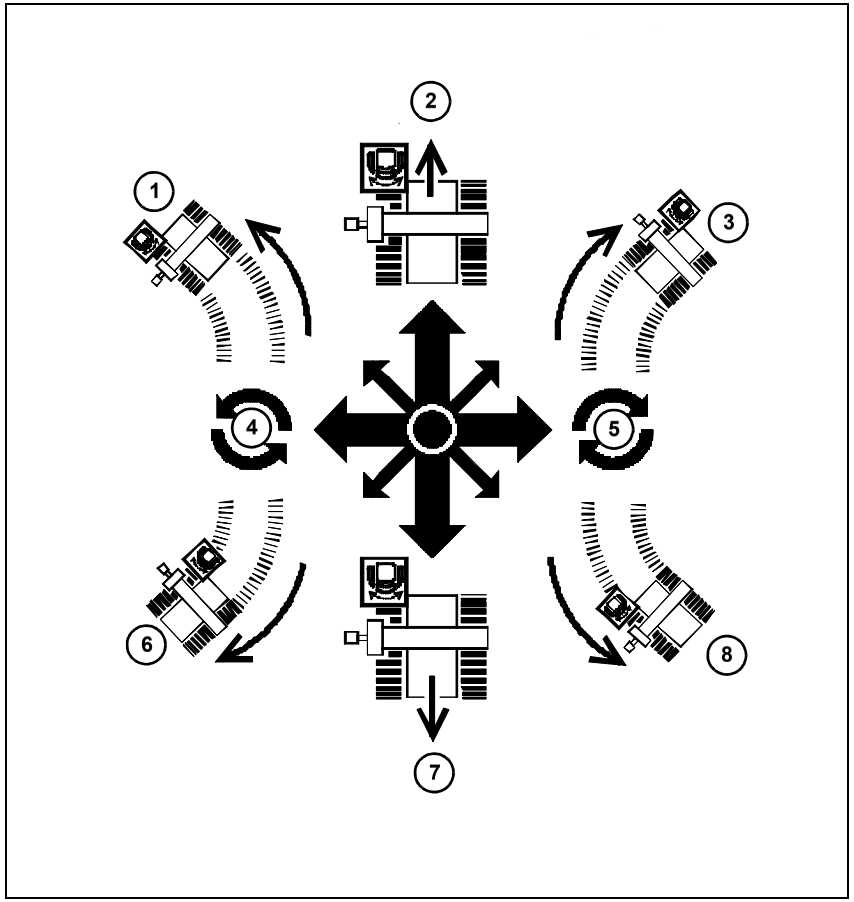
(4) Move joystick straight left from neutral to counter-rotate counterclockwise

(5) Move joystick straight right from neutral to counter-rotate clockwise

(6) Move joystick back and left

(7) Move joystick back

(8) Move joystick back and right



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Right Joystick Controls

(1) *Hammer on/off button*
Press and release . . . . . **turn on hammer**
Press again . . . . . **turn off hammer**

This control is only active in work mode (seat rotated to the left).

(2) *Hammer – momentary button*
Press and hold . . . . . **hammer functions only while holding button**

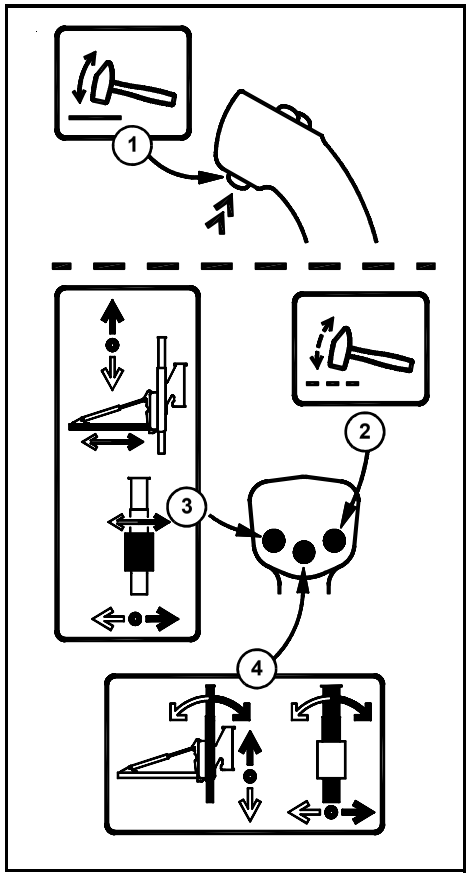
This control is only active in Work mode.

(3) *Mast slide button*
Press and hold
While pushing joystick forward . . . . . **mast slides away from machine**
While pulling joystick back . . . . . **mast slides toward machine**

While pushing joystick left. . . . . **mast slides toward rear of machine**
While pushing joystick right . . . . . **mast slides toward front of machine**

(4) *Mast tilt button*
Press and hold
While pushing joystick forward . . . . . **mast tilts away from machine**
While pulling joystick back . . . . . **mast tilts toward machine**

While pushing joystick left. . . . . **mast tilts toward rear of machine**
While pushing joystick right . . . . . **mast tilts toward front of machine**

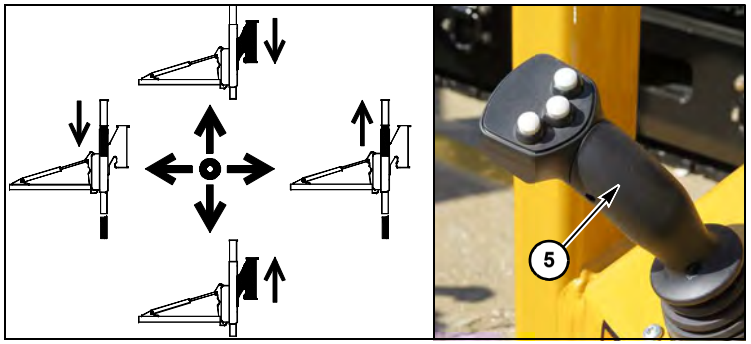


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(5) *Mast and hammer raise and lower*

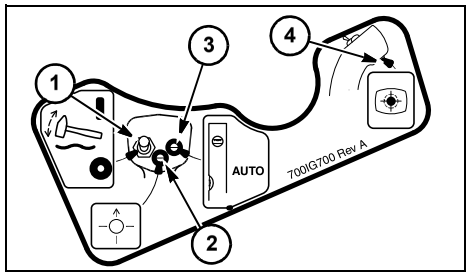
Push joystick forward . . . . . **lower hammer**
Pull joystick rearward . . . . . **raise hammer**
If hammer is raised above proximity switch zone, ground speed is limited. Refer to “Ground speed range,” *page 20-24.*

Joystick left . . . . . **lower mast**
Joystick right . . . . . **raise mast**



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Left Joystick



(1) *Hammer float switch*

Push up . . . . . **hammer float on**

Push down . . . . . **hammer float off**

(2) *Auto home mast slide switch* (enhanced cylinder option)

Slides mast to a preset, user adjusted, position within the horizontal slide range (both X/Y axes).

(3) *Auto plumb switch*

Auto plumb automatically moves mast to vertical position.

Press . . . . . **auto plumb activated**

Press again . . . . . **auto plumb canceled**

Auto plumb does not function if:

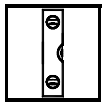
- Operator's station is not in Work mode
- Mast is tilted 5° or more away from machine, or 11° or more toward machine (with hammer in low position)
- Mast is tilted 5° or more in any direction from plumb (with hammer in high position)
- Hammer is engaged
- Mast functions are engaged
- Ground drive is engaged

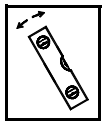
(4) *GPS auto target switch* (if equipped with compatible third-party GPS system)

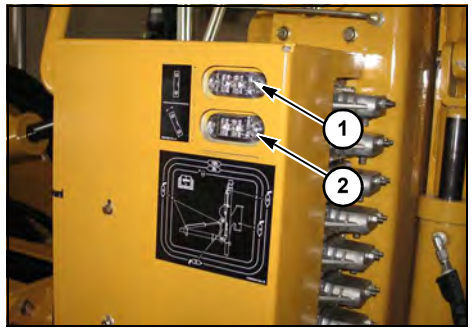
Slides mast to reach GPS target.

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Mast Plumb Lights







(1) Green light on . . . . . .mast within plumb tolerance range

(2) Amber light flashing . . . . . .auto plumb cycle active

If amber light and green light are on at the same time, mast is within plumb tolerance but green light turned off at least once since completion of auto plumb.

Hammer Speed Dial

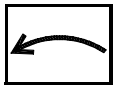






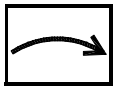


(1) Hammer Speed (blows per minute)



Left/counterclockwise . . . . . **decrease hammer speed**

Center . . . . . **detent, hammer speed at 75%**

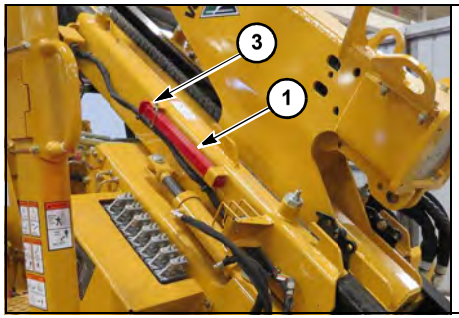


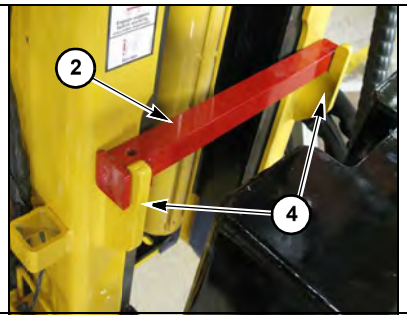
Right/clockwise . . . . . **increase hammer speed**

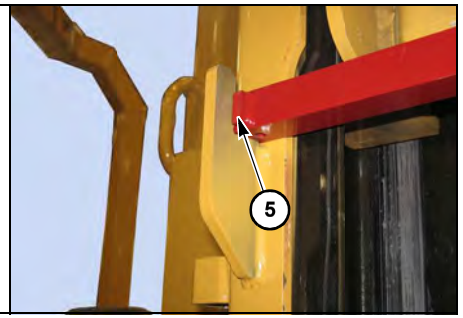
NOTICE: Never operate hammer without hammer being in contact with the pile.

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Hammer Support Bar







(1) Storage position

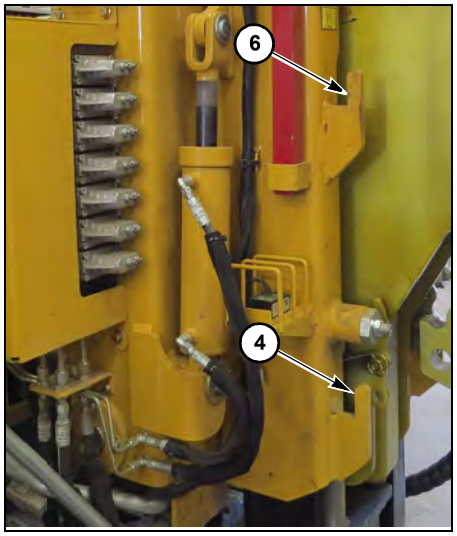
(2) Service position

Step 1: Remove snap pin **(3)** and slide support bar out of storage position.

Step 2: Install bar in lower brackets **(4)**, with stop **(5)** on support bar, positioned to prevent bar from sliding.

Step 3: Lower hammer to support bar.

A second set of brackets **(6)** is provided for some service procedures.



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Laser Receiver (Option)

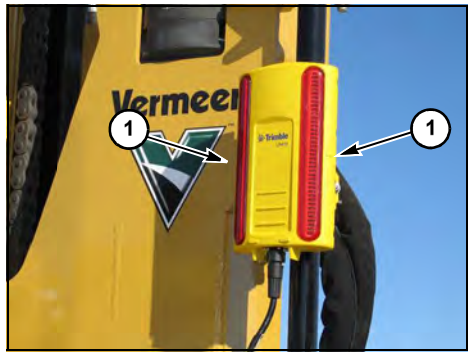
Laser receiver is mounted on hammer carriage.

Hammer slows as it approaches laser-set height.

Hammer stops when it reaches laser-set height.

Arrows **(1)** on receiver are set points.

Press *measure mode key* to select laser elevation mode.
Refer to “Measure mode key,” *page 20-4.*



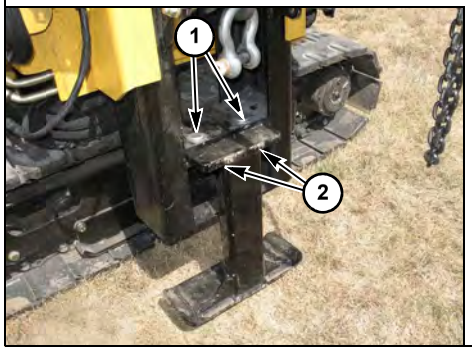
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Stabilizer Foot

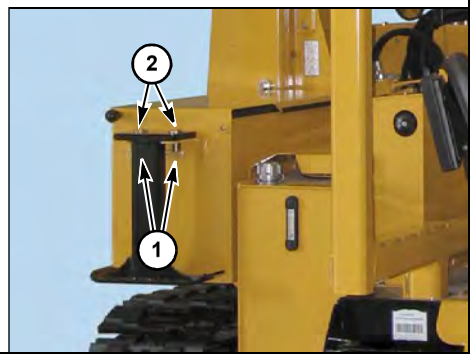
The stabilizer foot is used for pile extraction.

Secure in work position or storage position with pins **(1)** and hairpins **(2)**.

Stabilizer foot in work position



Stabilizer foot in storage position

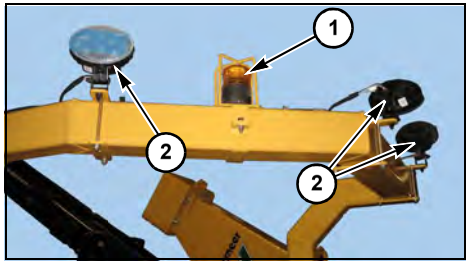


Lights

(1) Beacon for optional remote control

Beacon turns on when remote is enabled.

(2) Work lights



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Access Panels

Access – Engine

At rear of machine, release latches and open door **(1)** to access:

- Engine oil: fill, filter, and dipstick
- Fuel/Water separator filter (Deutz engine only)

Access – Coolant

At rear of machine, unscrew knob to slide plate **(2)** to the side and access radiator cap.

Access – Hydraulic Pump

At rear of machine, remove bolts and shield **(3)** to access hydraulic pump stack.

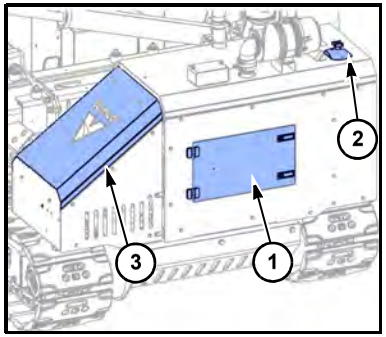
Access – Battery/Battery Disconnect Switch

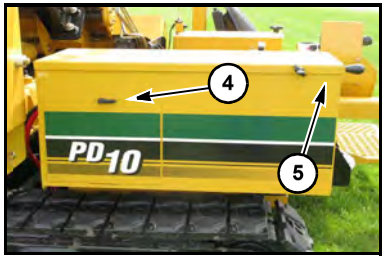
On right side, access for the following:

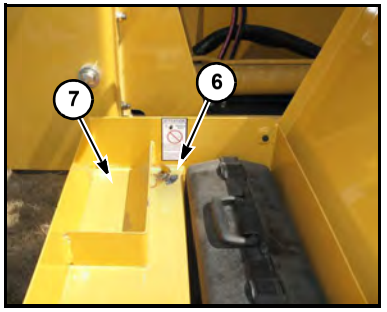
- Open compartment **(4)** to access battery.
- Open toolbox **(5)** to access *battery disconnect switch* **(6)**.

Access – Storage For Optional Remote Control

- The storage location for an optional remote control **(7)** is inside the toolbox **(5)**.



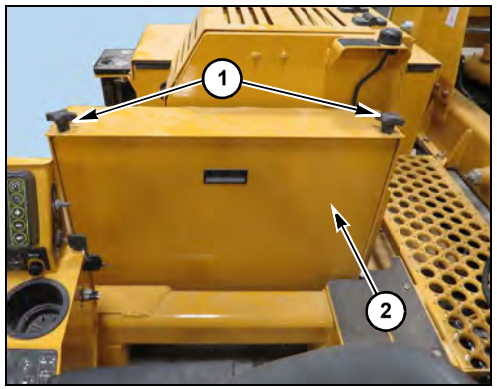




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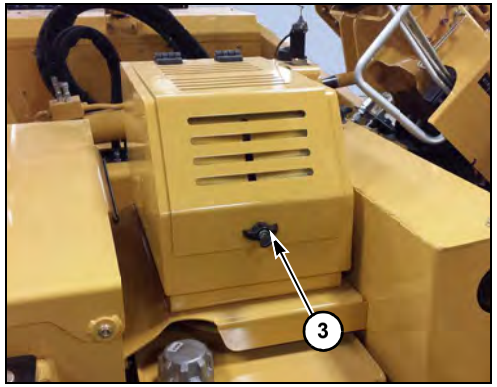
Access – Fuses/Relays

At front of machine by operator's station, unscrew knobs **(1)** and remove shield **(2)** to access fuse panel and relays.



Access – Telematics, Compatible Third-party GPS System

Open compartment **(3)** to access telematics hardware and connection for compatible third-party GPS system.



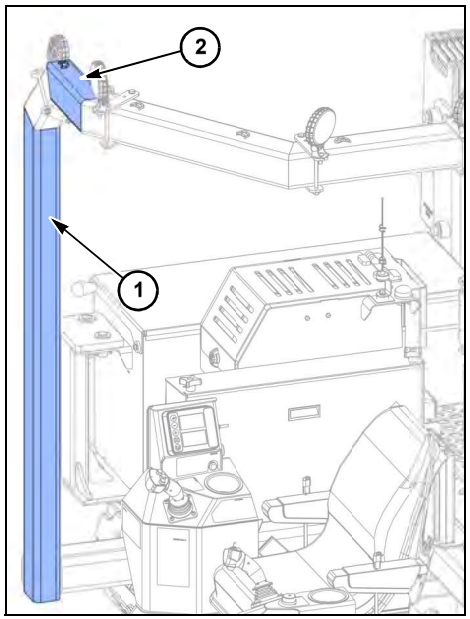
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Fire Extinguisher Mounting Location

A fire extinguisher (not supplied with machine) can be mounted on right side post of ROPS **(1)**. Clamp the fire extinguisher bracket to the ROPS bar. Do not drill or weld on the ROPS bar. Unauthorized modification of the ROPS could weaken the structure and reduce protection. Refer to “Rollover Protective Structure (ROPS),” *page 30-3.*

Warning Beacon Mounting Location

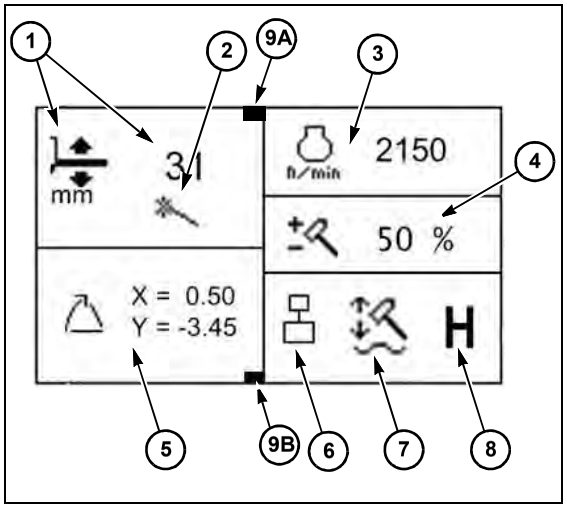
A warning beacon can be mounted on the overhead bar of the ROPS **(2)**. Clamp the warning beacon to the ROPS bar. Do not drill or weld on the ROPS bar. Unauthorized modification of the ROPS could weaken the structure and reduce protection. Refer to “Rollover Protective Structure (ROPS),” *page 30-3.*



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Controller Screens

Main Screen



(1) Laser elevation (if equipped)
Elevation from target in millimeters

(2) Measure mode selection
Refer to “Measure Mode Selections,” *page 20-25.*

(3) Engine speed
rpm

(4) Hammer speed flow output range
50 – 100%

(5) Mast frame angle
Angle away from vertical axis
X-axis is parallel to direction of travel.
Y-axis is perpendicular to direction of travel.
When auto plumb is active, the letter “A” replaces the icon.

(6) Remote control
On: remote enabled
Flashing: remote disabled or off
Off: operator in seat or remote receiver not installed

(7) Hammer float: float on

(8) Ground speed range
H: high speed range
L: low speed range
Only limited low speed range is allowed when hammer is in high position.
High and low speed ranges are allowed when hammer is in low position.

(9) Hammer high/low status
Position of black rectangle indicates hammer is in either high position **(9A)** or low position **(9B)**.

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Measure Mode Selections

Available modes depending on machine setup:

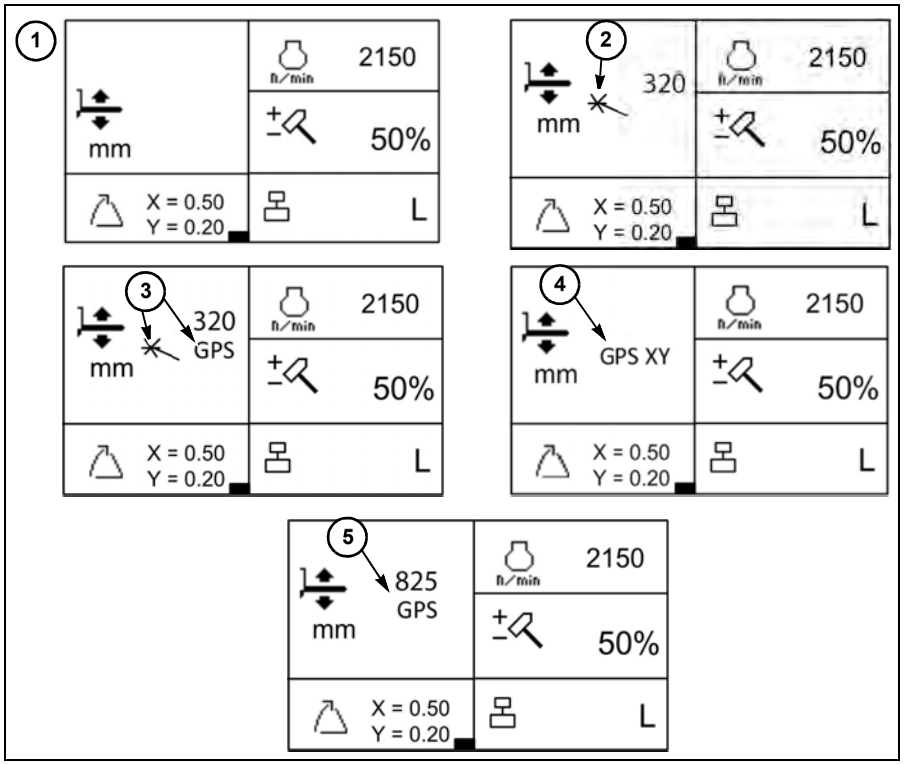
(1) Manual:
Manual positioning and elevation are enabled.

(2) Laser elevation:
Laser elevation is enabled and requires optional laser receiver. Manuals positioning enabled.

(3) Laser elevation with GPS X/Y:
Laser elevation is enabled and requires optional laser receiver. GPS positioning is enabled and requires compatible third-party GPS system.

(4) GPS X/Y:
GPS positioning is enabled and requires compatible third-party GPS system.

(5) GPS X/Y/Z:
GPS positioning and elevation is enabled, and requires compatible third-party GPS system.

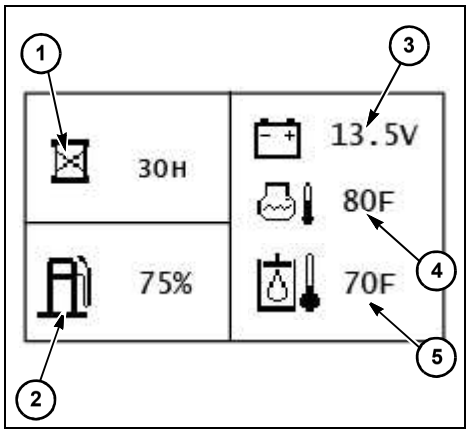


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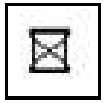
Engine Screen

The engine screen appears when *engine key* on DP10 controller is pressed.

Press *engine key* again to return to main screen.



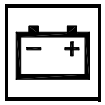
(1) Engine hours



(2) Fuel level



(3) System voltage



(4) Coolant temperature



(5) Hydraulic temperature



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Main Menu Screen

The main menu screen **(1)** appears when *menu key* on DP10 controller is pressed.

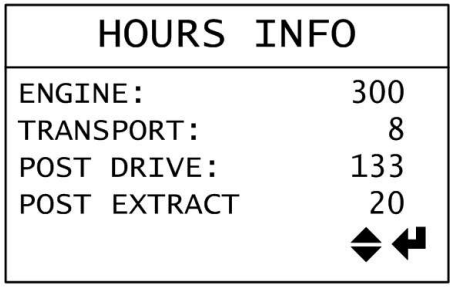
Press *increase/decrease keys* to highlight desired menu item. Press *enter key* to select highlighted item.

Press *menu key* to return to main screen.



Hours Info Screen

Screen displays engine hours, transport hours, post driving hours, and post extraction hours.



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Calibration Screen

Press *increase/decrease keys* to highlight desired calibration item. Press *enter key* to select highlighted item.

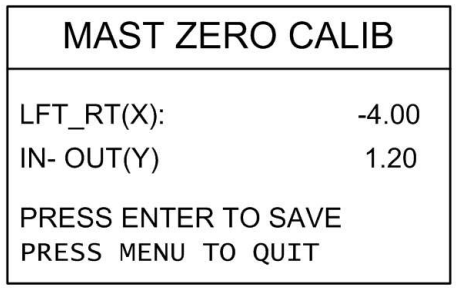


Mast Zero Screen

Use secondary measuring device, such as a bubble level, to verify mast is vertical. Then press *enter key* to set mast angle to zero.

X-axis is parallel to direction of travel.

Y-axis is perpendicular to direction of travel.



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Ground Drive Screens

Use these screens to adjust steering offset.

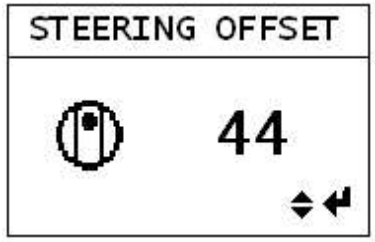
If the machine tracks more in one direction because of the position of the mast and hammer or ground conditions, changing the steering offset value guides the tracking to the other direction.

Step 1: Press *increase/decrease keys* to highlight desired item.
For forward travel, choose “STEERING FWD.”
For rearward travel, choose “STEERING REV.”

Step 2: Press *enter key* to select option.

Step 3: Press *increase/decrease keys* **(1)** to adjust bias. Adjustable range is -100 to +100.

- A lower steering offset value biases machine steering toward the left.
- A higher steering offset value biases machine steering toward the right.





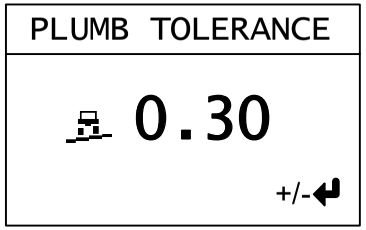
Plumb Tolerance Screen

Plumb tolerance allows the operator to choose the precision angle required to operate the auto plumb.

A value of 0.30 means ±0.3° from 0° will be considered plumb.

Tolerance is ±5.0° in 0.05° increments.

Press +/- *keys* to increase/decrease value.



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Hammer Offset Screen

Use this screen to adjust hammer shutoff when driving to either a laser receiver target or a GPS elevation target. This adjustment helps to compensate for varying soil density, and decreases the chance of over driving posts in softer soil conditions.

A value of 12 mm means that hammer is shut off 12 mm above target elevation. Adjust as needed for soil conditions. Regardless of offset value, controller screen will show actual distance to target elevation.

Offset is adjustable from 0 – 1 000 mm.

Press +/- *keys* to increase/decrease value.



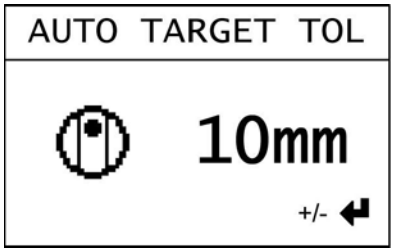
Auto Target Tolerance Screen

Auto target function uses a tolerance zone around target pile location to position mast using compatible third-party GPS system.

A lower value results in a smaller tolerance zone.

Tolerance is adjustable from 5 – 50 mm.

Press +/- *keys* to increase/decrease value.



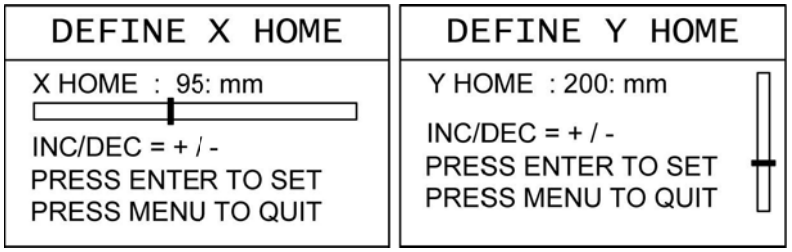
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Define X Home and Y Home Position Screens

These screens allow the “Return to Home” position to be defined for X and Y when used in conjunction with the slide position sensors.

Press +/- *keys* to increase/decrease value.

Press *enter key* to set value.



Park Brake Test Screen

Select this screen to perform a park brake test.

Engage ground drive after selecting brake test. Machine should not move during test. Contact local Vermeer dealer if machine moves during test.

“DISENGAGE GROUND DRIVE, THEN RETRY” will be shown on display if ground drive is active before selecting test. Refer to “Park Brake – Check,” *page 60-26.*

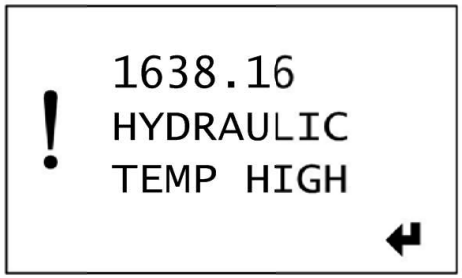


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DTC (Diagnostic Trouble Code) List Screen

When a fault becomes active, its code number and text is shown on the display. Faults remain on the display until they become inactive, are cleared, or until hidden by a higher priority fault.

Press *enter key* to clear it from the display. After clearing, fault is only shown if it becomes active again.



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Fault Storage Screen

Up to 10 faults are stored, with additional faults overwriting the oldest entry. View stored faults by selecting DTC List on the main menu display.

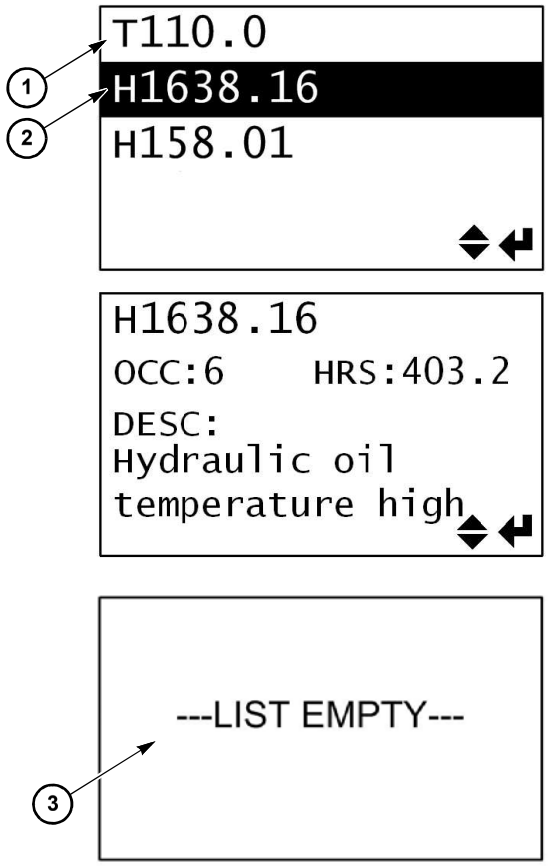
The fault list display shows active and previously active faults.

- Currently active fault: T before fault number **(1)**
- Previously active fault: H before fault number **(2)**

Use *+/- keys* to navigate through fault list.

Press *enter key* to select a fault and see more information. Descriptive text, total number of occurrences since last cleared and an engine hour time-stamp of the last occurrence is displayed.

“LIST EMPTY” **(3)** appears on the screen when no faults are stored.



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Valve Reset Key

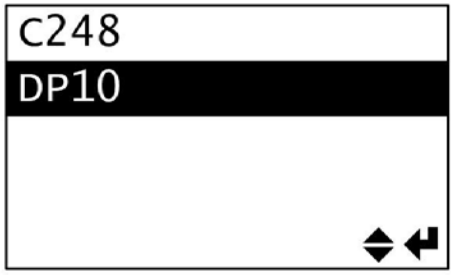
If mast or hammer fail to respond to joystick commands, a fault message will be shown on screen. Check behind valve banks for a red light. If red light is on, press *valve reset key* **(1)**.

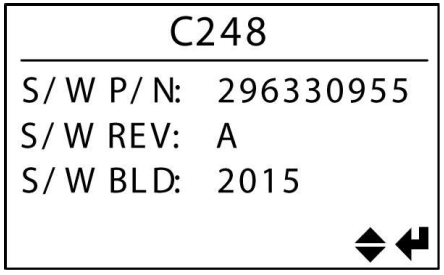
If issue continues after pressing key, contact your Vermeer dealer.

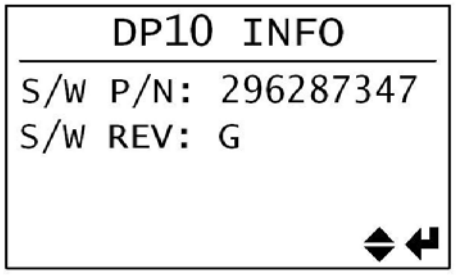


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Controller Screen (Information Only)







Use *+/- keys* to highlight a controller.

Press *enter key* to select controller and view its software information.

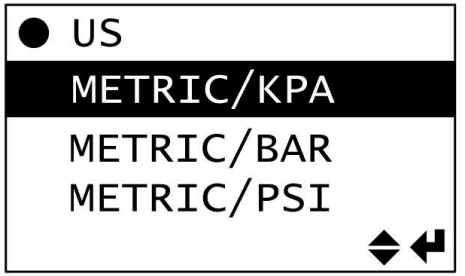
Information such as software part number, revision, and build is shown on screen depending on which controller is selected.

Units Selection Screen

Switch between U.S. units, metric units with kPa, metric units with bar or metric units with psi.

Use *+/- keys* to highlight a unit of measure.

Press *enter key* to select.



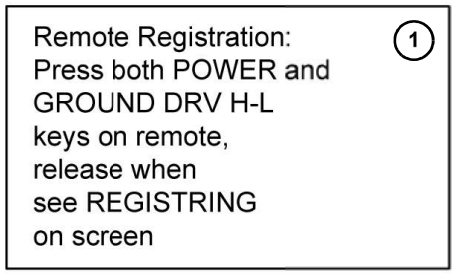
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Remote Register Screen

Use this screen to register remote control with remote receiver on machine.

Follow instructions as shown on remote control screen **(1)**.

When registration is completed, “REGISTERED” is shown on remote control screen.

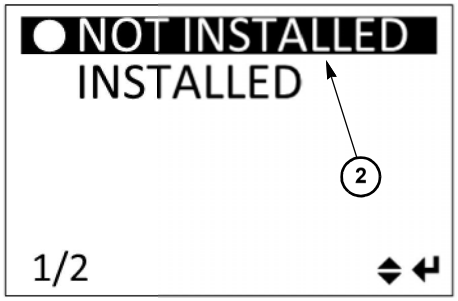


Remote Configure Screen

Remote control receiver is automatically detected when installed on machine. Use this screen if remote control receiver is removed.

Use *+/- keys* to highlight “Not Installed” **(2)**.

Press *enter key* to select.



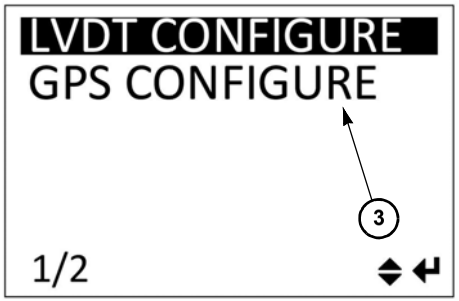
Optional Equipment Screen

LVDT sensors (used to monitor slide position) or compatible third-party GPS equipment is automatically detected when installed on machine. Use this screen if optional equipment is removed.

Use *+/- keys* to highlight optional equipment **(3)** that was removed.

Press *enter key* to select.

Use *+/- keys* to highlight “Not Installed” **(2)** and press *enter key* to select.



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Inclinometer Offline

When the inclinometer is offline (failed or disconnected), the fault message, “INCLINE SNSR COMM FAULT” will display. The machine functions will be affected and include one or more of the following:

- Engine speed will be limited to a maximum of 2,300 rpm (Deutz) or 2,500 rpm (Yanmar).
- Mast tilt is disabled with hammer in a high state.
- Mast tilt speed is limited with hammer in low state.
- Hammer raise/lower speed is limited.
- Mast raise/lower speed is limited.
- Ground drive speed is limited to low range.
- Auto plumb is disabled.
- Auto home is disabled.
- Auto target is disabled.
- Mast angle value is displayed as dashes.

Press enter to clear the fault message.

One of the following advisory messages will display when actuating a function that is not allowed:

- Inclinometer Offline
- Functions are Limited
- Read Operator’s Manual

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To position the machine for tracking:

Step 1: Lower hammer

Step 2: Lower mast

Step 3: Tilt mast to cradle

Before tracking, refer to “Transporting the Machine,” *page 30-1*.

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Section 21: Optional Remote Control

The remote control **(A)** is stored inside the toolbox. Refer to “Access – Storage For Optional Remote Control,” *page 20-21.*

Controls

(1) *Plus/Up key*

Increases value or scrolls up.
Also, the first key in remote control enable sequence

(2) *Minus/Down key*

Decreases value or scrolls down.
Also, the second key in remote control enable sequence

(3) *Enter key*

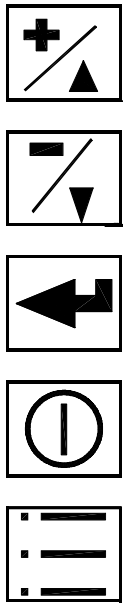
Selects a value or a selected menu item.
Also, the third key in remote control enable sequence

(4) *Power key*

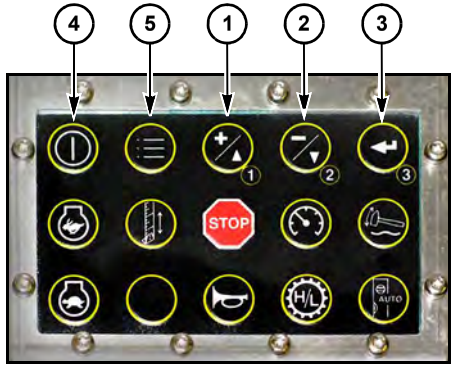
Press to turn remote control on/off

(5) *Menu key*

Press to access menu.
Also, used to back out of a selection without saving







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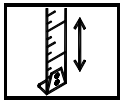
(6) *Throttle increase key*

Press . . . . . **increases rpm**



(7) *Measure mode key*

Press . . . . . **select desired measure mode**



(8) *Engine stop key*

Press . . . . . **stop engine**

This key stops engine if remote control is connected, regardless of whether the remote is enabled or disabled.



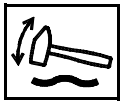
(9) *Engine screen key*

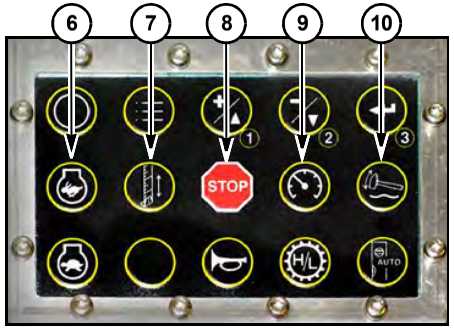
Shows engine screen. Refer to *page 20-26.*



(10) *Hammer float key*

Press . . . . . **hammer float on**
Press again . . . . . **hammer float off**





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(11) *Throttle decrease*

Press . . . . . **decreases rpm**



(12) *Horn*

Press . . . . . **sounds horn**



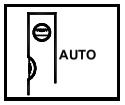
(13) *Two-Speed ground drive key*

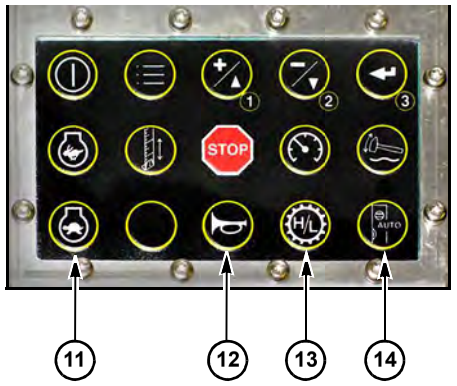
Press . . . . . **toggles between high and low ground speeds**



(14) *Auto plumb key*

Automatically positions the mast vertically.
Press . . . . . **activates auto plumb**
Press second time . . . . . **cancels auto plumb**





Auto plumb does not function when:

- Mast is tilted 5° or more away from machine, or 11° or more toward machine (with hammer in low position).
- Mast is tilted 5° or more in any direction from plumb (with hammer in a high position).
- Hammer is engaged.
- Mast functions are engaged.
- Ground drive is engaged.

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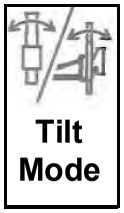
(15) *Mast tilt button* . . . . . .Hold button and use *right joystick* (A) to tilt mast

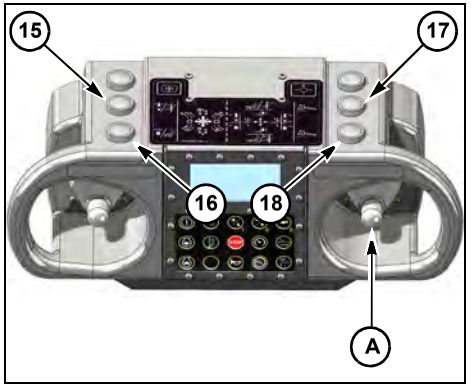
Push joystick left . . . . . **mast tilts toward rear of machine**

Push joystick right . . . . . **mast tilts toward front of machine**

Push joystick forward . . . . . **mast tilts away from machine**

Pull joystick back . . . . . **mast tilts toward machine**





(16) *Mast slide button* . . . . .Hold button and use *right joystick* (A) to slide mast

Push joystick left . . . . . **mast slides toward rear of machine**

Push joystick right . . . . . **mast slides toward front of machine**

Push joystick forward . . . . . **mast slides away from machine**

Pull joystick back . . . . . **mast slides toward machine**



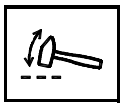
(17) *Hammer on/off button*

Press and release . . . . . **turns hammer on**
Press again . . . . . **turns hammer off**



(18) *Hammer momentary on button*

Press and hold . . . . . **hammer on**
Release . . . . . **hammer off**

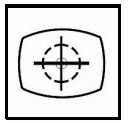


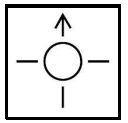
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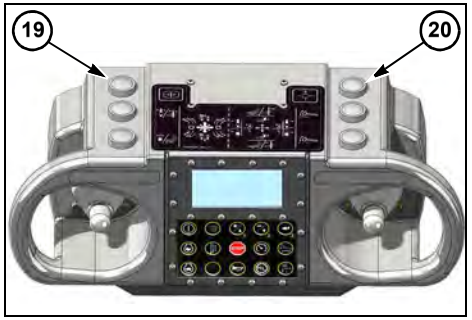
(19) GPS auto target (option)
For use with machines equipped with compatible, third-party GPS system. If equipped, slides mast to a preset, GPS planned position within the horizontal slide range (both X/Y axes). Refer to “Auto Target Tolerance Screen,” *page 20-30.*

(20) Auto home mast slide (enhanced cylinder option)

If equipped, slides mast to a preset, user adjusted position within the horizontal slide range (both X/Y axes). Refer to “Define X Home and Y Home Position Screens,” *page 20-31.*







Remote Control Screens

Remote control display screens are identical to machine controller screens.

Refer to “Controller Screens,” *page 20-24.*

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Enable/Disable Remote Control

To enable the remote control:

Step 1: Press *power key* **(1)** to turn remote control on.

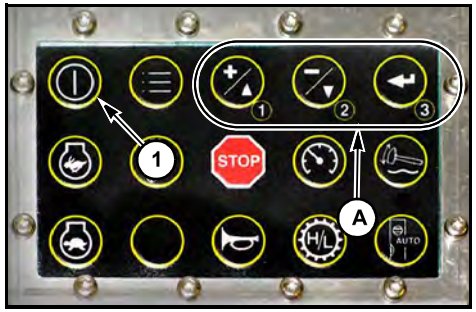
Step 2: Wait for “Enter Code” to appear on the remote control display and press *keys 1, 2, 3* **(A)** in sequence to enable the remote control.

If an operator sits in the seat or a joystick control on the machine is activated, remote will be disabled and functions in progress will stop. Remote cannot be enabled again until operator leaves the seat and machine joystick controls are returned to neutral.

To turn remote control off:

Step 1: Press and hold *power key* **(1)** until screen is blank.

Step 2: Release *power key*.



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Remote Control Joysticks

(1) *Left remote joystick*

(2) *Right remote joystick*



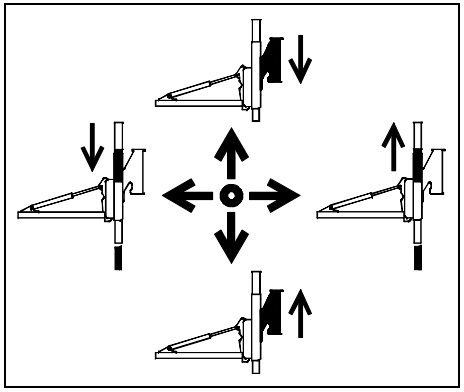
Mast and Hammer Raise/Lower

Move *right remote joystick* left. . . . . **lower mast**

Move *right remote joystick* right . . . . . **raise mast**

Push *right remote joystick* forward . . . . . **lower hammer**

Pull *right remote joystick* backward. . . . . **raise hammer**



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Ground Drive Controls

Remote control steering functions using *left remote joystick*:

(1) Move joystick forward and left.

(2) Move joystick forward.

(3) Move joystick forward and right.

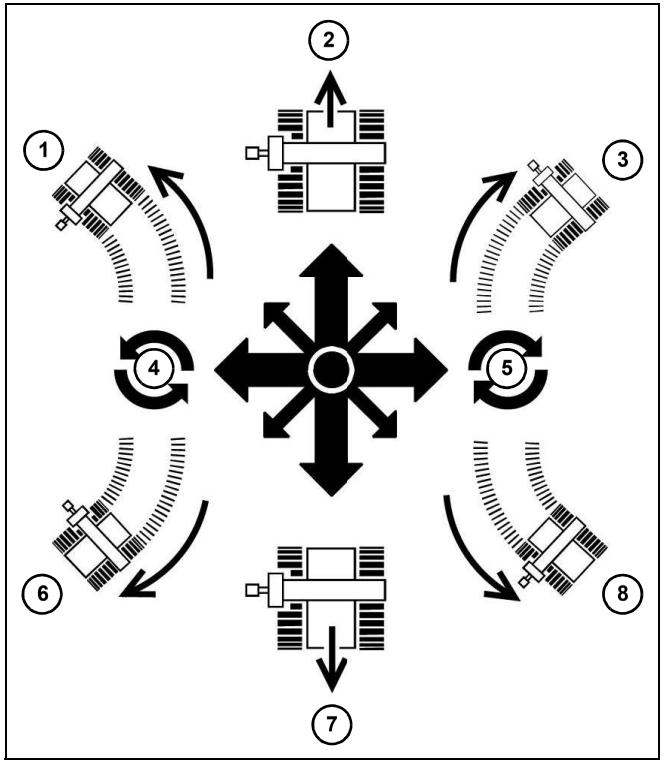
(4) Move joystick left from neutral to counterrotate counterclockwise.

(5) Move joystick right from neutral to counterrotate clockwise.

(6) Move joystick backward and left.

(7) Move joystick backward.

(8) Move joystick backward and right.



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Registering the Remote Control

The remote control must be registered to a machine the first time it is used with that machine.

Step 1: Press *power key* **(1)**. The connecting screen **(2)** appears.

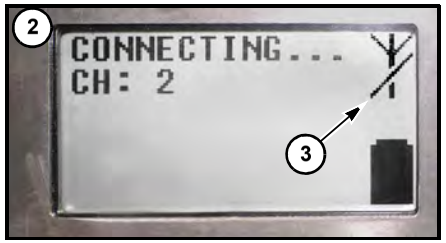
The antennae symbol **(3)** with a diagonal line appears when the remote control is not registered to the machine. The diagonal line disappears when the remote control is successfully registered.

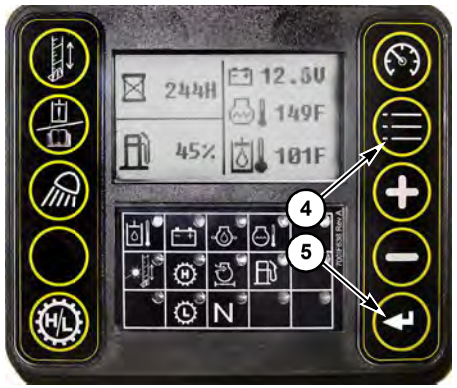
Step 2: Press the *menu key* **(4)** on the machine controller.

Step 3: From the menu, select “Remote Register.” Refer to “Main Menu Screen,” *page 20-27.*

Step 4: Press *enter key* **(5)**.







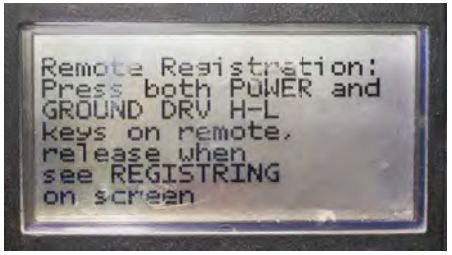
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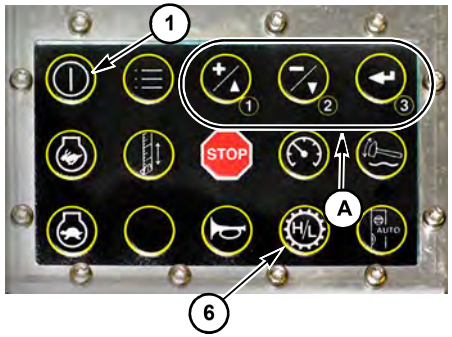
Step 5: Machine controller screen now displays instructions: Press and hold both *Power key* **(1)** and *two-speed ground drive key* **(6)** on remote control; release when “REGISTERING” is on the remote-control screen.

Step 6: When remote-control screen prompts for a password, press *keys 1, 2, 3* **(A)** in sequence.

The remote control is now registered. The beacon should turn on.

The remote-control screen should match the controller screen.

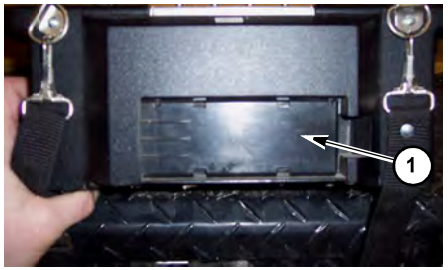




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Remote Control Batteries

Remote control uses six AA batteries. Remove battery pack **(1)**. Install new batteries and place battery pack back into position.



Batteries should last 40 hours or more. A battery status symbol on the remote control LCD displays the current battery charge level/status during startup as follows:

	Battery is fully charged.		Battery is 10 – 90% charged.
	Battery is discharged.		Battery is not connected.

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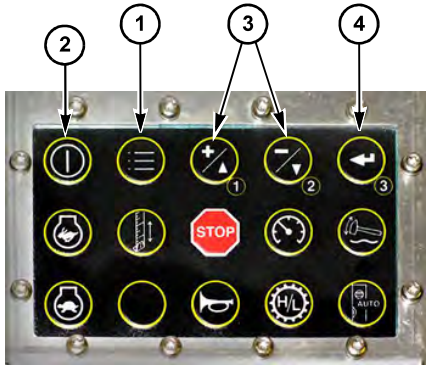
Remote Control – Settings Menu

(1) *Menu key*

(2) *Power key*

(3) *Arrow keys*

(4) *Enter key*



With remote control power on, press and hold *menu key* down and then press *power key* for approximately two seconds. The settings menu will appear. Use *arrow keys* to scroll through settings menu. Use *enter key* to select a highlighted menu item. Press and hold *menu key* down and press *power key* to leave a selected screen or the settings menu; or scroll to “EXIT.”

- VERSIONS
  Press *enter key* to view software version and remote control model number.

- BACKLIGHT
  Press *enter key* to turn display backlight on/off.

- REGISTER
  Refer to “Registering the Remote Control,” *page 21-9.*

- BASE PWR
  For Vermeer dealer use.

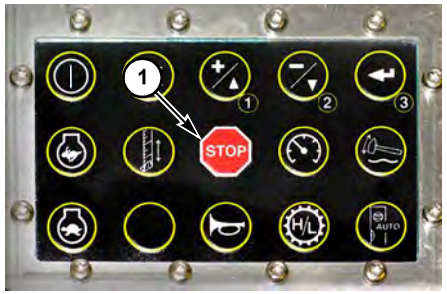
- REMOTE PWR
  For Vermeer dealer use.

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- NEXT CHAN
  - Change the communications channel when interference from another electronic device is suspected.
  - Remote control must be enabled. Refer to “Enable/Disable Remote Control,” *page 21-6.*
  - With remote control on, enabled, and within communication range of the machine, press the *enter key* once to select the next available channel. Allow up to 10 seconds for new channel to register with base unit.
- FIELD STR
  For Vermeer dealer use.
- CONTRAST+
  Press *enter key* repeatedly to increase display contrast to desired level.
- CONTRAST-
  Press *enter key* repeatedly to decrease display contrast to desired level.
- SELF TST 1
  For Vermeer dealer use.
- SELF TST 2
  For Vermeer dealer use.
- MFG RANGE
  Not used.
- SET DEFAULT
  Press *enter key* to reset remote control to default settings. After reset, the remote control must be re-registered to the base unit. Refer to “Registering the Remote Control,” *page 21-9.*
- EXIT
  Press *enter key* to exit the settings menu.

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Remote Control Operating Range



These operating ranges assume the remote-control system including transmitter, batteries, and receiver are in correct operating condition.

Normal range: within 100 ft (30 m)

Maximum recommended range: up to 300 ft (91 m)

- Check range before operating machine.
- Do not exceed usable operating range.
- Recharge or replace battery if range is not at least 100 ft (30 m) (refer to maintenance manual for procedures).
- Range may exceed 300 ft (90 m).

A symbol (below) on display indicates whether the remote control is in or out of range:

	Remote Control communicates with base.
	Remote Control does not communicate with base.

Non-communication symbol displays whenever remote control is out of range. While remote control is out of range, track functions and all momentary switch functions on the remote control stop. Communication symbol displays as soon as the remote control comes back within range.

NOTICE: *Engine stop key* **(1)** will not function when remote control is out of range.

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Section 22: Starting Procedure

Starting the Engine

Operator should be seated at machine controls, with seat belt fastened, when starting the engine.

Step 1: Move all controls to neutral.

Step 2: Turn *keyswitch* **(1)** to run position and wait for glow plug timer to expire.

Step 3: Turn *keyswitch* to start position; release *keyswitch* when engine starts.

- Display **(2)** shows engine screen for five seconds, then shows main screen.
- When *keyswitch* is in run position, “Preheat Wait” message may appear on controller display for up to seven seconds, depending on coolant temperature.

NOTICE: If engine does not start within 15 seconds, turn key off, wait 30 seconds, then repeat engine starting sequence. Do not allow the starter motor to run continuously for more than 15 seconds.

Step 4: Verify that oil pressure indicator light **(3)** goes out.

Step 5: Warm up engine. Do not operate the engine under load until engine has warmed up for approximately three to five minutes at low speed.



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Cold Weather Starting

Refer to the Engine Operation Manual for cold weather starting. When temperature may drop below 5°F (-15°C), remove battery from machine and store indoors until next machine use.

When operating in cold weather, use recommended engine oil viscosity and fuel to reduce starting issues.

Step 1: Turn *keyswitch* to run position. Screen stating “Preheat Wait” will appear on controller display for up to seven seconds, depending on coolant temperature.

Press *enter key* to clear advisory from screen before display time has expired.

Step 2: Screen stating “Preheat Ready” will appear on controller display for a maximum of 10 seconds. Turn *keyswitch* to start position.

Hydraulic Fluid

Allow adequate time for hydraulic oil to warm up, especially in cold weather. Refer to the specifications section of the maintenance manual for recommended hydraulic fluids.

Reduce engine speed if hydraulic pump makes a high-pitched noise, indicating lack of oil which can damage the pump.

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Jump-Starting

Battery Explosion – Prevent



WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Battery explosion can blind. Acid can blind and burn. Tools and cable clamps can make sparks.

Do not smoke. Shield eyes and face. Read instructions.

Do not jump-start or charge a battery that is frozen or low on electrolyte.

If equipped with battery caps, they must be in place and tight to reduce risk of battery explosion.

NOTICE: Use only a 12-volt system for jump-starting. Do not allow vehicle used to jump-start to be in contact with the disabled machine. Vehicles in contact have a ground connection which allows a spark to occur at the battery when the positive jumper cable is connected or removed.

Battery Burns – Prevent

Battery contains sulfuric acid which can cause severe burns. Prevent contact with eyes, skin, and clothing.

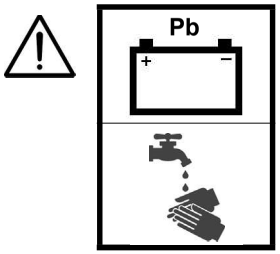
In case of acid contact:

External**:** Flush with plenty of water. If eyes have been exposed, flush with water for 15 minutes and get prompt medical aid.

Internal**:** Drink large quantities of water or milk, then milk of magnesia, beaten egg, or vegetable oil. Call a physician immediately.

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Jump-Starting Procedure



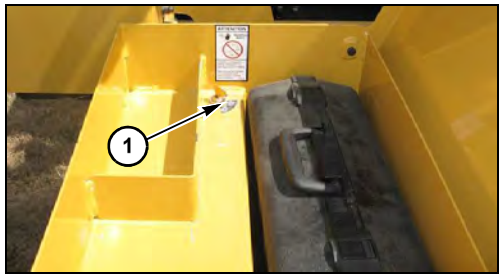
WARNING: Battery post, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.

Wash hands after handling.

Step 1: Turn *keyswitch* to off.

NOTICE: Wait 60 seconds before disconnecting the battery. This is necessary to allow electronic controllers to complete their respective cycles.

Step 2: Turn *battery disconnect switch* **(1)** to disconnect.



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Step 3: Connect jumper cables in this order:

a. Red to discharged battery positive (+) terminal **(2)**.

b. Red to boost battery positive (+) terminal **(3)**.

c. Black to boost battery negative (-) terminal **(4)**.

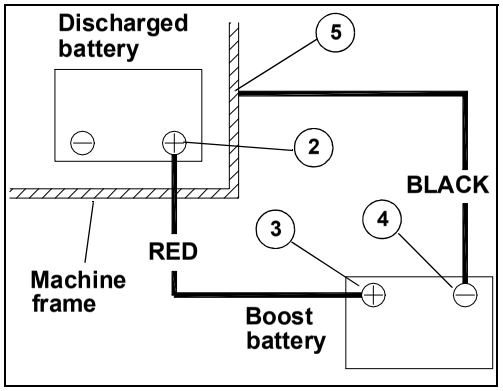
d. Black to frame **(5)** of machine with the discharged battery. Make connection away from battery, hydraulic lines, and moving parts. Do not attach to the negative (-) terminal of discharged battery.

To prevent sparks near the battery, always disconnect the negative (black) jumper cable from the frame **(5)** before disconnecting the positive (red) cable from the battery.

Step 4: Turn *battery disconnect switch* to connect.

Step 5: Follow *Starting Procedure, page 22-1.*

Step 6: Remove cables in reverse order and install covers over cable clamps. Close and latch battery access shield.



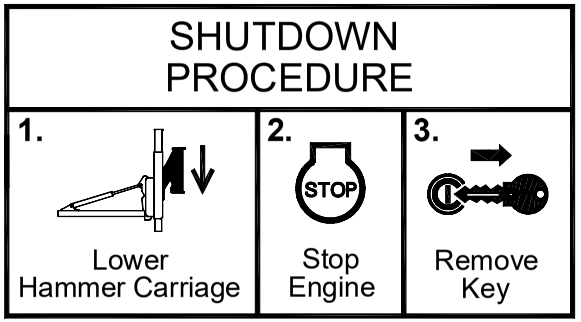
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Section 23: Shutdown Procedure

For your safety and the safety of others, use the shutdown procedure before working on the machine for any reason, including servicing, cleaning, inspecting, or transporting the machine.

A variation of this procedure may be used if so instructed within this manual or if an emergency requires it.



Step 1: Lower hammer.

NOTICE: Whenever practical and safe, allow engine to run at low idle for one to five minutes before shutting down after operating at full power. Please consult machine's engine manual for details.

Step 2: Reduce engine speed to low idle.

Deutz engine: Allow engine to run at low idle for one minute after operating at full load.

Yanmar engine: Allow engine to run at low idle for five minutes after operating at full load.

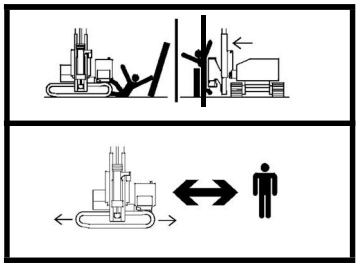
Step 3: Shut off engine and remove key.

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Section 30: Transporting the Machine

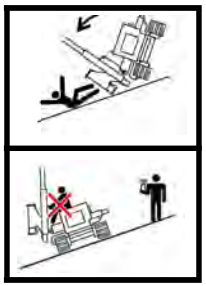
Driving the Machine



WARNING: Machine movement can crush.

Stay away from machine while transporting.

Drive machine at a speed correct for the terrain. When using remote, do not operate machine faster than you can comfortably walk. Keep feet away from the tracks when driving. Do not stop, start, or turn suddenly unless it is necessary. Keep hammer low when driving machine. If driving over uneven ground, fold mast and keep weight balanced over tracks.



WARNING: Rollover possible. Be alert and use extreme caution when operating on hillsides, or near ditches, gullies, holes, or obstructions where rollover could occur. Death or serious injury can result if crushed under the machine. Never allow anyone to be on the downhill side of the machine.

Never allow anyone to ride on machine.

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Safe Operating Slope

Safe operating slope depends on many factors:

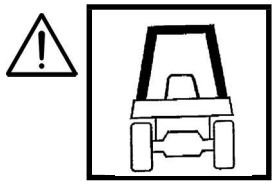
- Machine weight distribution, including mast and pile position
- Height of hammer
- Even or rough ground conditions
- Potential for ground giving way, causing unplanned forward, reverse, or sideways tilt
- Nearness of ditches, ruts, stumps, or other obstructions and sudden changes in slope
- Speed
- Turning
- Braking performance
- Skill of operator

These varying factors make it impractical to specify a maximum safe operating angle in this manual. It is, therefore, important for the operator to be aware of these conditions and adjust operation accordingly. Maximum engine angle and braking performance are two absolute limits which must never be exceeded. These maximums are stated here because they are design limits. These angles are not operating limits and must never be used alone to establish safe operating angles for varying conditions.

- Maximum engine lubrication angle -30° all directions
- Service brake retarding force – equal to traction of both tracks
- Secondary brake – equal to traction of one track
- Park brake holding force – equal to traction of both tracks

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Rollover Protective Structure (ROPS)



WARNING: The rollover protection structure (ROPS) is intended to protect the tractor operator in the event of a rollover. In order for you to be protected by the ROPS, you must wear seat belts. Follow instructions below relating to ROPS safety precautions.

- Do not operate machine with ROPS removed.
- Do not modify ROPS in any manner. Unauthorized modifications, such as welding, drilling, cutting, or adding attachments, could weaken the structure and reduce your protection.
- If ROPS has been damaged or subjected to a rollover, it must be replaced. Do not attempt any repairs.
- The ROPS has been certified to a maximum gross machine weight as stated on the label located on the ROPS. Under no circumstances may total gross weight of machine exceed weight specified on ROPS label.
- If ROPS must be replaced, be sure to use original parts ordered from Vermeer Corporation.

If rollover occurs:

- Brace yourself and stay on the machine. Keep the seat belt fastened.
- Hold on firmly and lean away from the point of impact.

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Mount and Dismount Safely

- Face machine when mounting and dismounting.
- Maintain a three-point hand/foot contact with the access system (one hand and two feet or two hands and one foot). Keep all handrails in place.
- Do not use any controls or screens as handholds when climbing on or off the machine.
- Never jump off the machine.
- Keep steps, platforms and operator's area clear of objects and debris, which may cause difficulties stepping on or off the machine or interfere with control movement.
- Never get on or off a moving machine.

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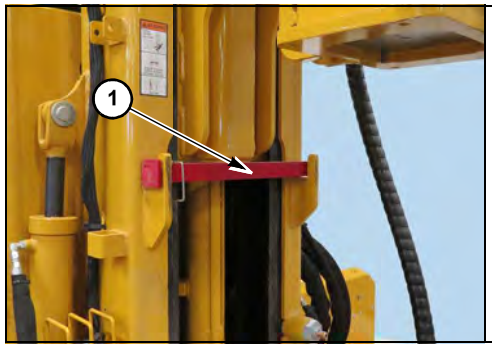
Preparing for Trailer Transport

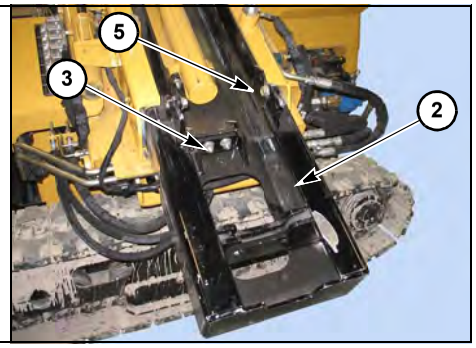
Machine With 10-ft Mast

Additional steps may be required if a compatible third-party GPS system is installed.

Step 1: Follow *Starting Procedure*, page *22-1*.

Step 2: Center mast vertically and horizontally.





NOTICE: Failure to center mast before tilting toward machine may result in mast colliding with cradle.

Step 3: Lower mast.

Step 4: Raise hammer.

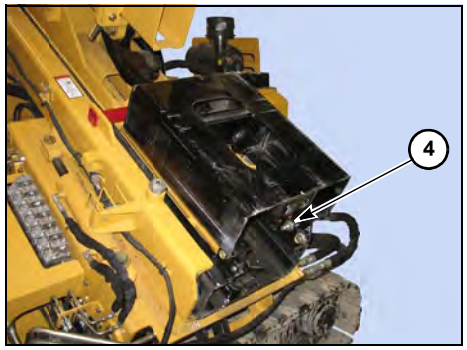
Step 5: Install hammer support bar **(1)** in bracket.

Step 6: Lower hammer to contact hammer support bar.

Step 7: Tilt mast slightly toward machine.

Step 8: Loosen bolts **(5)**.

Step 9: Fold up bottom section **(2)** of mast: remove bolts **(3)**, attach suitable lifting device to bottom section of mast. Bottom mast section weighs 85 lb (39 kg). Fold, install bolts **(3)** in side holes **(4)** with threads toward center of mast.



NOTICE: Install bolts **(3)** with threads toward center of mast. Installing bolts incorrectly may damage mast.

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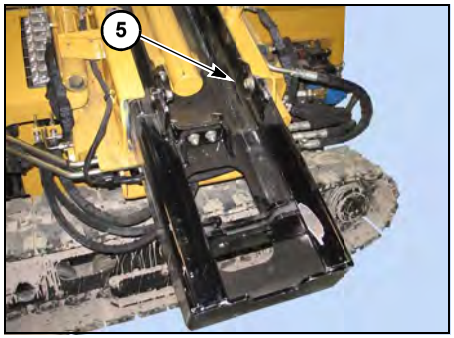
Depending on size of guide installed, the hammer may need to be raised slightly for clearance when folding bottom section. If hammer is raised for clearance, lower hammer until it contacts support bar or bottom section. If hammer does not contact support bar, then remove support bar and stow.

Step 10: Tighten bolts **(5)**.

Step 11: Tilt mast fully toward machine.

Step 12: Slide mast toward machine until it stops. Adjust as needed so that mast does not collide with cradle.

Step 13: Verify transport dimensions are correct for machine with 10-ft mast. Refer to *page 70-5.*



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Machine With 15-ft Mast

Additional steps may be required if a compatible third-party GPS system is installed.

Step 1: Follow *Starting Procedure,* page *22-1.*

Step 2: Center mast vertically and horizontally.

NOTICE: Failure to center mast before tilting toward machine may result in mast colliding with cradle.

Step 3: Lower mast.

Step 4: Raise hammer.

Step 5: Install hammer support bar **(1)** in bracket.

Step 6: Lower hammer to contact hammer support bar.

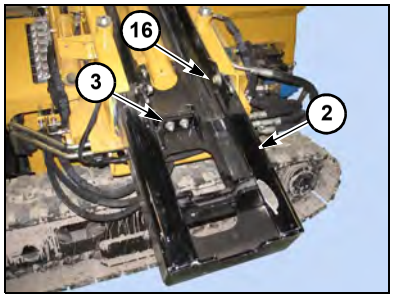
Step 7: Tilt mast slightly toward machine.

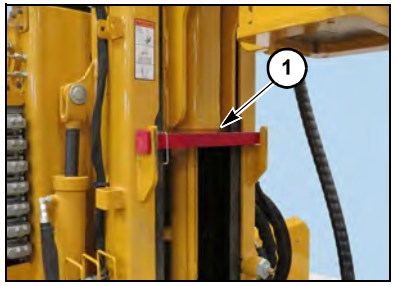
Step 8: Loosen bolts **(16)**.

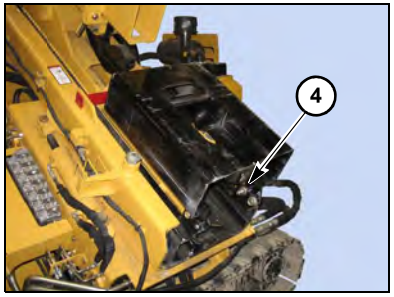
Step 9: Fold up bottom section **(2)** of mast: remove bolts **(3)**, attach suitable lifting device to bottom section of mast. Bottom mast section weighs 85 lb (39 kg). Fold, install bolts **(3)** in side holes **(4)** with threads toward center of mast.

NOTICE: Install bolts **(3)** with threads toward center of mast. Installing bolts incorrectly may damage mast.

Depending on size of guide installed, the hammer may need to be raised slightly for clearance when folding bottom section. If hammer is raised for clearance, lower hammer until it contacts support bar or bottom section. If hammer does not contact support bar, then remove support bar and stow.



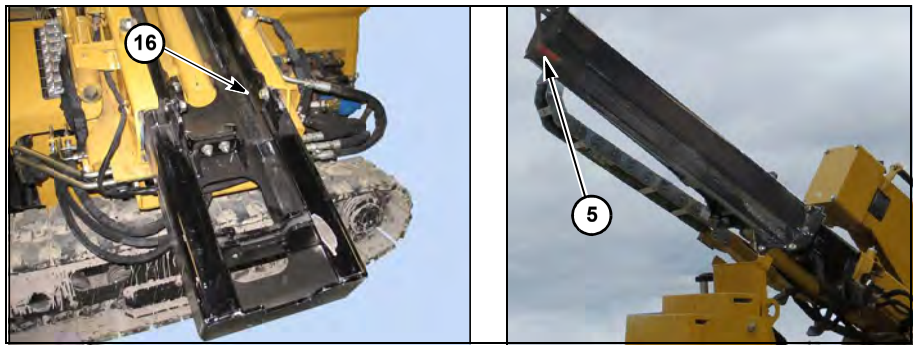




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Step 10: Tighten bolts **(16)**.

Step 11: Tilt mast fully toward machine, and attach a suitable lifting device to top of mast **(5)**. Top section of 15-ft mast weighs 190 lb (86 kg).



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Step 12: Raise mast until top of hinge bracket **(6)** aligns with the lower mast slide adjusters **(7)**.

NOTICE: If mast is lifted too high with bottom section folded, lower mast adjusters could fall out of holders.

Step 13: Adjust lifting device to support the mast.

Step 14: Remove four bolts **(8)** securing two halves of mast. Retain bolts in toolbox.

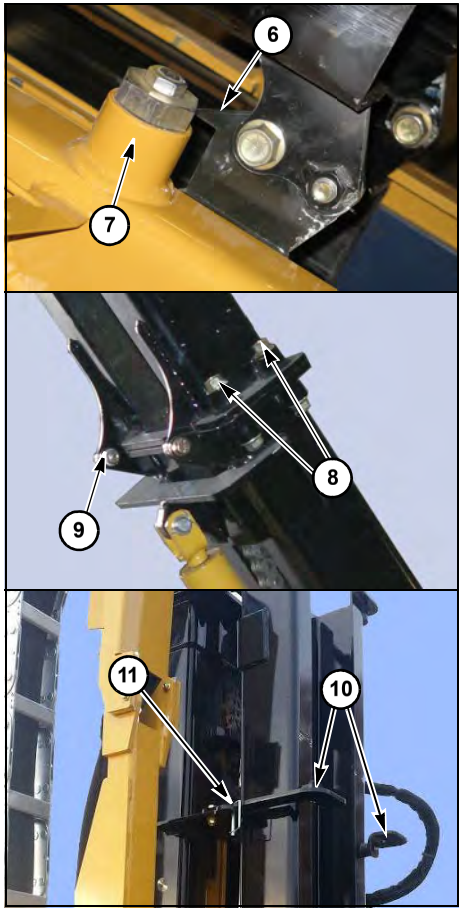
Step 15: Tilt mast away from machine, allowing top half of mast to fold down at hinge **(9)**. Adjust lifting device as needed during this process until both mast sections are vertical.

Step 16: Remove lifting device from top of mast.

Step 17: Remove linchpins **(11)** and engage locks **(10)**.

Step 18: Insert linchpins **(11)** in locks (**10)**.

Step 19: Tilt mast toward machine until it stops.

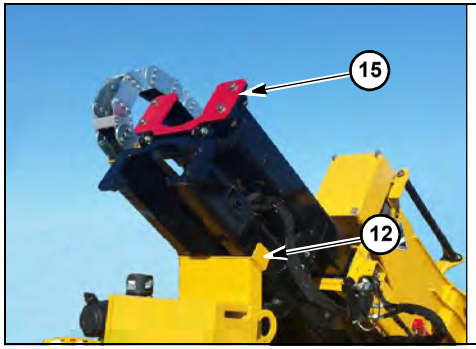


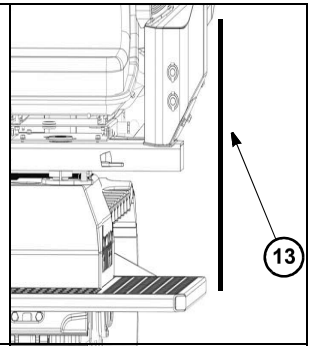
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Step 20: Slide mast toward machine until it starts to contact cradle **(12)**. Adjust as needed so that mast does not collide with cradle.

Step 21: Verify that bottom of lowered mast **(13)** is even with side of operator's station platform.

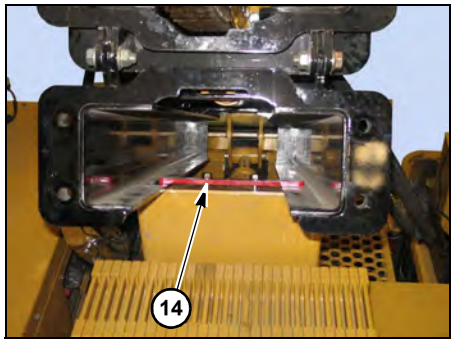
Step 22: Install lock plate **(14)** and bolts.





Step 23: Install mast cap plate **(15)** on lower half of mast hinge. Secure with four bolts. Use shorter bolts with plate, stored in toolbox.

Step 24: Verify transport dimensions are correct for machine with 15-ft folded mast. Refer to *page 70-5.*



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Machine With 20-ft Mast

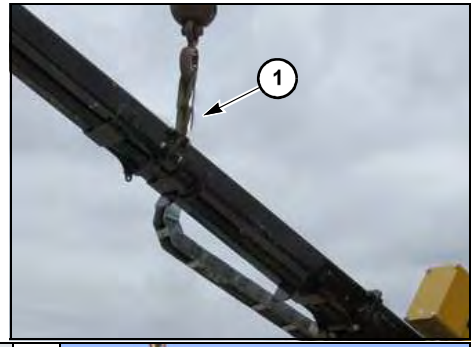
Additional steps may be required if a compatible third-party GPS system is installed.

Step 1: Follow *Starting Procedure,* page *22-1.*

Step 2: Center mast vertically and horizontally.

NOTICE: Failure to center mast before tilting toward machine may result in mast colliding with cradle.

Step 3: Tilt mast completely toward machine and attach a suitable lifting device slightly above bolted joint of top two mast sections **(1)**. Top two sections of mast weigh 380 lb (172 kg) combined.

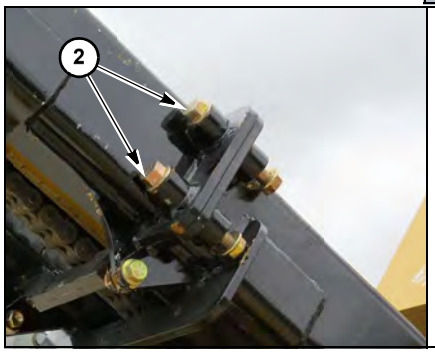


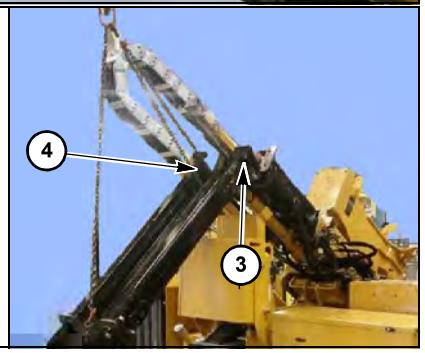
Step 4: Adjust lifting device to support the mast.

Step 5: Remove four bolts **(2)** securing top two sections of mast to lower portion of mast. Retain bolts in toolbox.

Step 6: Lower lifting device and let top two sections of mast fold down at hinge **(3)** until properly supported.

Step 7: Attach a second suitable lifting device to top two sections of mast **(4)** close to the hinge.





Step 8: Properly support top two sections of mast to prevent movement and remove bolts from hinge **(3)**.

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Step 9: Lower top two sections of mast to the ground.

Step 10: If needed, remove four bolts **(5)** to disassemble top two sections of mast.

Step 11: Install mast cap plate **(6)** on lower portion of mast at hinge. Secure with four shorter bolts stored in toolbox.

Step 12: Lower mast completely.

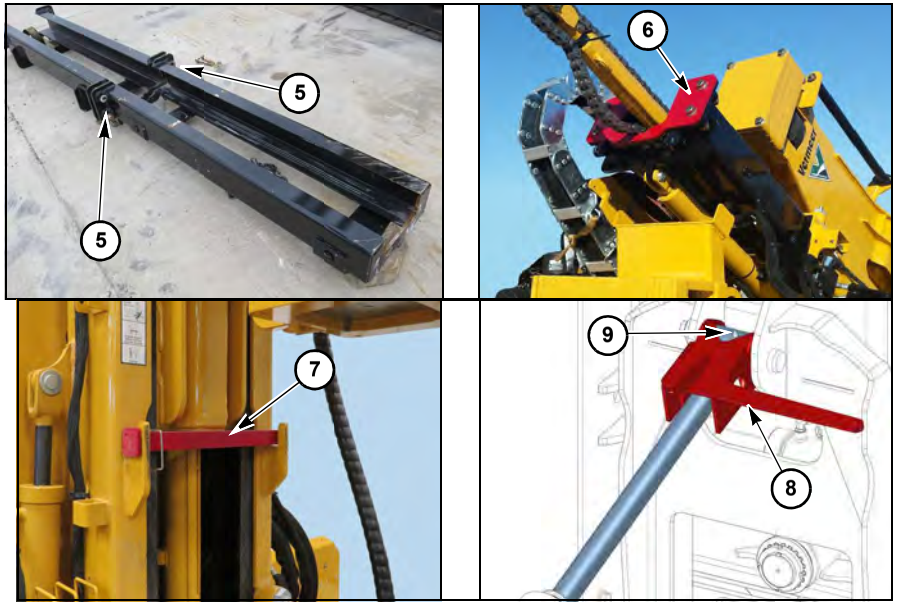
Step 13: Raise hammer.

Step 14: Install hammer support bar **(7)** in top bracket (if more than one bracket).

Step 15: Lower hammer to contact hammer support bar **(7)**.

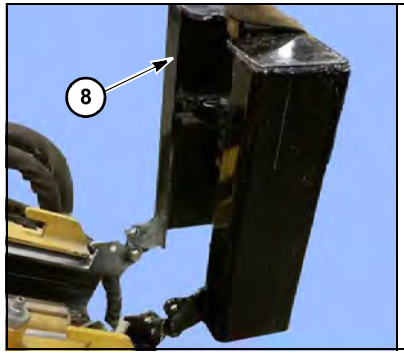
Step 16: If not equipped with mast tilt positioner **(8)**, proceed to Step 17 to remove bottom section. Leave mast tilted toward machine.

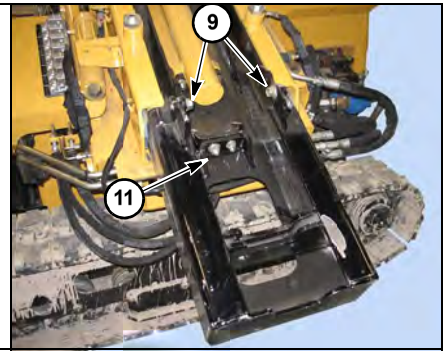
If equipped with mast tilt positioner **(8)**, tilt mast away from machine to vertical position, place on mast tilt cylinder pivot **(9)** (mast may need to be raised slightly or slid away from machine slightly to install **(7)**), tilt mast fully toward machine, then proceed to Step 18 to fold bottom section.



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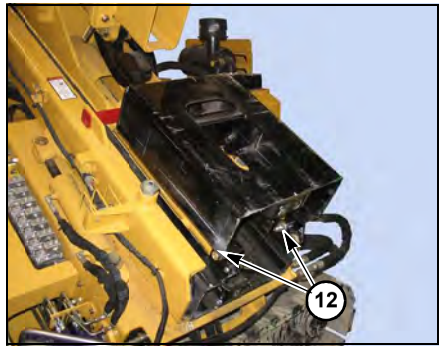
Step 17: Attach suitable lifting device to bottom section of mast **(8)**. Bottom mast section weighs 85 lb (39 kg).





- Remove bolts **(11)** and loosen bolts **(9)**.
- Lift bottom section and remove bolts **(9)**.
- Remove bottom mast section.
- Store bolts **(9)**, **(11)** and bottom section.
- Tilt mast fully toward machine.
- Slide mast fully toward machine, adjusting as needed so that mast does not collide with cradle.
- Proceed to Step 19.

Step 18: Attach suitable lifting device to bottom section of mast **(8)**. Bottom mast section weighs 85 lb (39 kg).



- Loosen bolts **(9)** to allow folding.
- Remove bolts **(11)**.
- Fold up bottom section of mast.
- Install bolts **(11)** into holes **(12)** with threads toward center of mast.

NOTICE: Depending on size of guide installed, hammer may need to be raised slightly for clearance when folding bottom section. Lower hammer to contact support bar after folding. If hammer does not contact support bar, then remove support bar and store.

- Tighten bolts **(9)**.

Step 19: Verify transport dimensions are correct for 20-ft mast machine. Refer to *page 70-5.*

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Reducing Transport Width (20-ft Mast Only)

After following transport preparation procedure, if machine is still too wide for local regulations, follow this procedure to fold down hose carrier.

Step 1: Attach suitable lifting device to hose carrier **(1)**. This portion of hose carrier weighs 500 lb (227 kg).

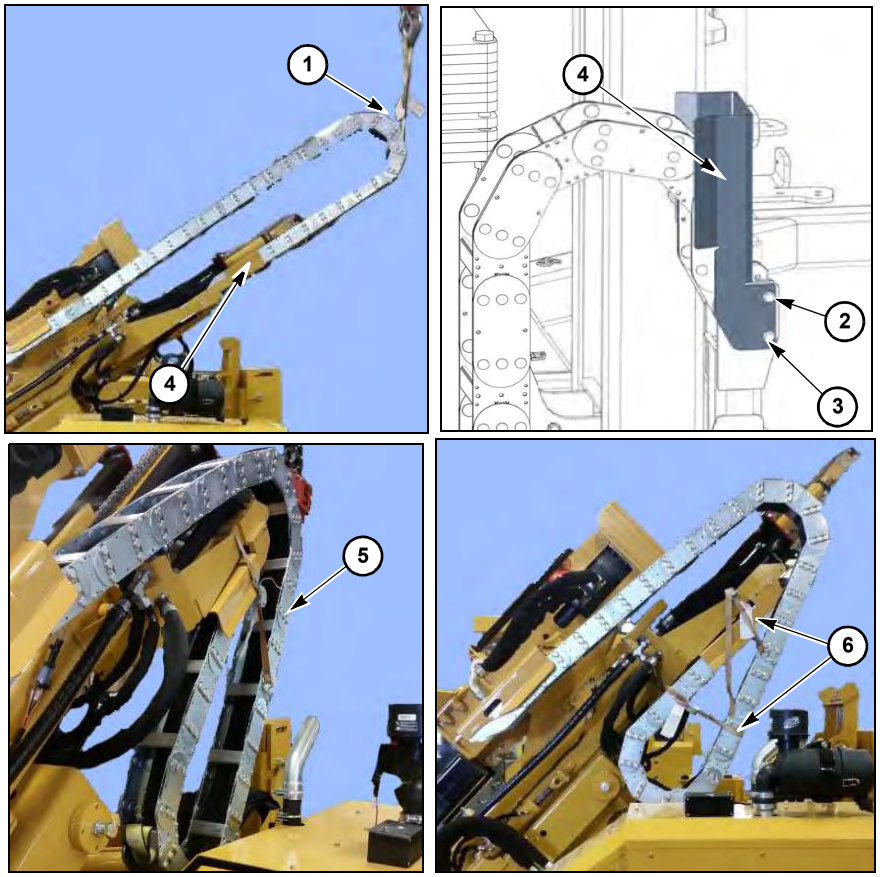
Step 2: Adjust lifting device to support the hose carrier.

Step 3: Remove bolts **(2)** and loosen bolts **(3)** while supporting hose carrier support **(4)** to keep it from lowering quickly.

Step 4: Fold hose carrier down into position **(5)**.

Step 5: Attach straps **(6)** to secure hose carrier.

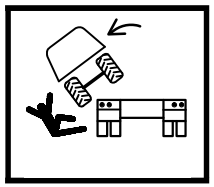
Step 6: Verify transport dimensions are correct. Refer to *page 70-5.*



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Trailering the Machine

Loading



WARNING: Unintended machine movement may occur when loading or unloading on slippery, dirty or uneven trailer surfaces. Death or serious injury can result if struck or crushed by machine. Ensure trailer is level and all loading surfaces are clean and free of debris. Do not attempt to load onto slippery trailer surfaces. Use smooth and controlled steering movements.

- Read the towing vehicle and trailer manuals for safety precautions and information.
- Ensure gross weight of the machine with attachments is within the weight limits of the trailer and towing vehicle. Refer to “Machine Specifications,” *page 70-2.*
- Properly attach trailer to towing vehicle and chock wheels or engage park brake of towing vehicle.
- Ensure you are qualified to operate the machine. Refer to “Operator Qualifications,” *page 40-1.*
- Slowly drive machine on and off trailer squarely to minimize steering.
- Do not attempt to steer machine when balanced at trailer/ramp transition.
- Position machine at location for tie-downs and weight distribution as recommended by trailer manufacturer.

Step 1: Center machine on the trailer centerline; drive squarely onto the trailer. Stop at the tie-down position for correct weight distribution as recommended by the trailer manufacturer.

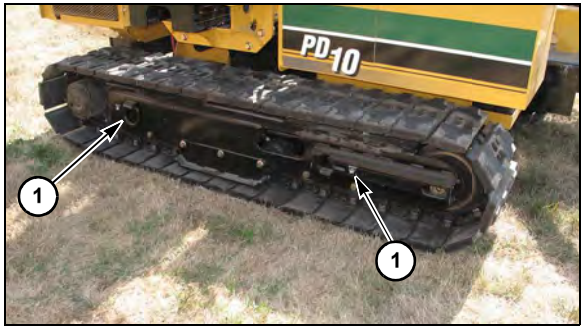
Step 2: Follow *Shutdown Procedure,* page *23-1.*

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Tie-Down Procedure

Fasten each corner of the machine to the trailer using tie-downs **(1)** provided on the machine.

Consult state and federal highway regulations for requirements on the proper securing of equipment.



Unloading

To unload machine, park trailer on a level surface. Unload machine only when trailer is attached to a tow vehicle.

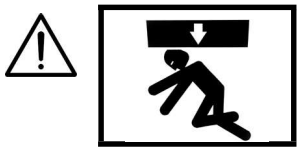
Step 1: Remove tie-down chains.

Step 2: Follow *Starting Procedure,* page *22-1.*

Step 3: Use a slow ground speed to unload machine.

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Lifting the Machine



WARNING: Never lift machine over personnel. The load may fall or shift, crushing anyone beneath it.

No provisions are made for lifting the machine. If transport requires that machine be lifted, it must be loaded and secured in an appropriate container.

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Retrieval

Towing device (chain, cable, or strap) must have a minimum working load of 150% of towing machine weight.

NOTICE: Do not tow machine more than 500 ft (150 m). Do not exceed 1 mph (1.5 km/h).

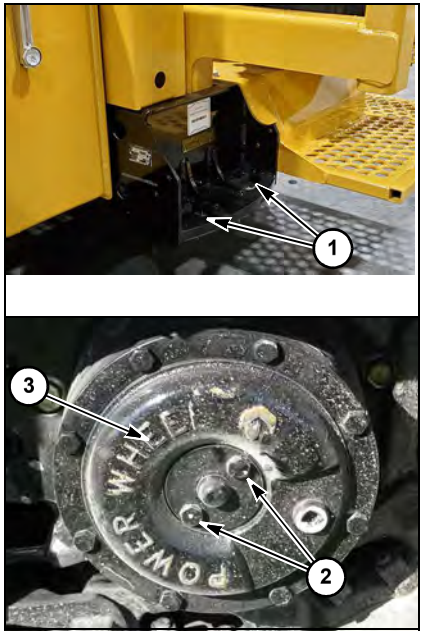
Use this procedure when towing a machine which has become mired or disabled.

Step 1: Connect tow towing device to tow points **(1)**.

Step 2: Remove and retain two 5/16 in screws **(2)** on each of two planetary cover plates **(3)**, one on each side of machine.

Step 3: Flip plates over and install with longer 1.5 in screws, so that gears will freewheel.

Step 4: When finished towing, install covers (using retained 5/16 in screws) in original configuration to engage gears.



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Section 40: Preparation

Preparing Personnel

Operator Qualifications



WARNING: Read Operator's Manual and safety signs, and watch the operations and safety video, before operating machine.

Allow only responsible, properly instructed individuals to operate machine.

Become familiar with the controls, operation and use of the machine under the supervision of a trained and experienced operator.

The operator must be familiar with the workplace's safety rules and regulations, and must be mentally and physically capable of operating the machine safely.

Safety Conscious Operators and Workers

Operators and workers must use reasonable accident-prevention measures, including correctly locating all underground utilities.

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Training

Before operating the PD10, the operator and crew must be trained in the operation of the unit. Conduct initial training at a site free of underground utilities and review the following:

- All sections of this manual
- Processes and procedures used to locate underground utilities
- Jobsite safety, including safety barriers and protective clothing, as well as operating and emergency procedures
- Machine shutdown procedure
- Transportation of the unit
- Setup of the unit
- Pile driving and removal

Safety Signs and Operating Instructions

Safety signs and operating instructions provide information on potential safety hazards and safe operating instructions.

Operator Presence Switch

The operator presence system uses a switch in the seat **(1)** to detect the presence of an operator. The operator must be seated in order to operate a function.

If the operator leaves the seat while operating a function, the function will stop within three seconds. All controls must be returned to neutral before any function can be resumed.

The operator presence system is intended for your safety and must be maintained in good functional condition. Contact your Vermeer dealer if it does not function properly.



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Seat Belt

Seat belts must be worn at all times while the machine is being operated from the operator's station.

The seat belt is an essential part of the rollover protection system. It helps keep the operator in the protected area inside rollover protective structure. Inspect seat belt every time it is used, looking for cuts, or worn webbing, or any defect in the latch assembly. If any wear or damage is noted, do not operate machine until seat belt is replaced.

If it is necessary to clean belts, use a mild soap solution and lukewarm water. Do not use bleach, dye, solvents, or other chemicals, which may weaken the belts.

To fasten automatic locking retractor seat belts:

Step 1: Pull latch steadily until it reaches buckle. If retractor locks before latch reaches buckle, allow belt to full retract and then retry.

Step 2: Insert latch into buckle until positive snap is heard.

Step 3: Verify there are no twists in the seat belt webbing.

Step 4: Allow retractor to take up any slack in the webbing.

Step 5: Pull sharply on the webbing to make sure retractor is locked.

Wear seat belt low and snug.

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Rollover Protective Structure (ROPS)

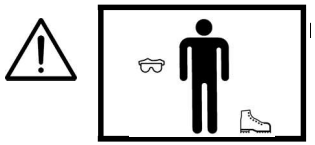
- Do not operate machine with ROPS removed.
- Do not modify ROPS in any manner. Unauthorized modifications, such as welding, drilling, cutting, or adding attachments, could weaken the structure and reduce your protection.
- If ROPS has been damaged or subjected to a rollover, it must be replaced. Do not attempt any repairs.
- The ROPS has been certified to a maximum gross machine weight as stated on the label located on the ROPS. Under no circumstances may total gross weight of machine exceed weight specified on ROPS label.
- If ROPS must be replaced, be sure to use original parts ordered from Vermeer Corporation.

If rollover occurs:

- Brace yourself and stay on the machine. Keep the seat belt fastened.
- Hold on firmly and lean away from the point of impact.

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Personal Protection



WARNING: Wear required personal protection equipment.Wear close-fitting clothing and confine long hair. Avoid wearing jewelry such as rings, wristwatches, necklaces or bracelets. Always wear safety glasses and safety shoes.

Working around the machine requires you to wear protective equipment. Always wear a hard hat, safety shoes, hearing protection, and eye protection. If working near traffic, you may need to wear reflective clothing.

Hearing protection is required when operating the machine. Hearing protection devices provide differing levels of sound reduction. It is important to select a device that is adequate and appropriate for your specific work environment. Actual sound levels may vary widely, depending on your working conditions. To determine the level of hearing protection your work environment requires, consult your local environmental noise specialist.

Safety shoes must be rated for impact (I/75), compression (C/75), and metatarsal protection (Mt/75) or have equivalent ratings, in compliance with national or regional standards.

Eye protection must consist of wraparound safety glasses or goggles.

Others working in immediate area must also wear the above listed protective equipment.

Wear close-fitting clothing and confine long hair.

Do not wear jewelry, such as rings, wristwatches, necklaces, or bracelets.

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Sound and Vibration Levels



Levels for Deutz Engine Options

The stated sound levels are representative for a given operating condition. Operating conditions may vary at each jobsite. The actual sound levels for your application and operating conditions may be different.

Equivalent Continuous A-Weighted Sound Pressure at Operator's Ear
as determined by directive 2000/14/EC and ISO 6396. . . . . 114 dB(A)

Guaranteed Sound Power Level
as determined by directive 2000/14/EC, ISO 6395, ISO 3744 . . . . . 132 dB(A)

Whole Body Vibration according to ISO 2631-1 . . . . . .less than 0.5 m/s^2

Right and Left Hand/Arm Vibration according to ISO 5349 . . . . . .less than 2.5 m/s^2

Levels for Yanmar Engine Option

The stated sound levels are representative for a given operating condition. Operating conditions may vary at each jobsite. The actual sound levels for your application and operating conditions may be different.

Equivalent Continuous A-Weighted Sound Pressure at Operator's Ear
as determined by directive 2000/14/EC and ISO 6396. . . . . 105 dB(A)

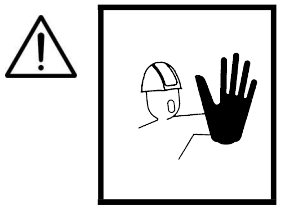
Guaranteed Sound Power Level
as determined by directive 2000/14/EC, ISO 6395, ISO 3744 . . . . . 123 dB(A)

Whole Body Vibration according to ISO 2631-1 . . . . . .less than 0.5 m/s^2

Right and Left Hand/Arm Vibration according to ISO 5349 . . . . . .less than 2.5 m/s^2

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Prepare the Area



WARNING: Keep spectators away.

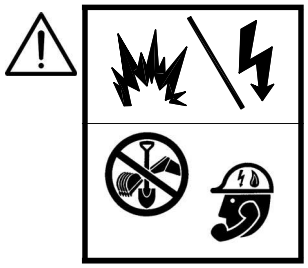
Look for Evidence of Underground Placement

Visually check for:

- Notices of underground placements
- Manhole covers
- Drop boxes
- Recent trenching activity

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Underground Utility Contact



WARNING: Striking an electrical line can cause electrocution. Striking gas line can cause an explosion. Cutting fiber optic cable could result in eye damage by laser light. Death or serious injury possible.

Locate utilities before driving posts. Call 811, 1-888-258-0808, or access www.call811.com (U.S. only); or contact local utility companies or national regulating authority.

Before you start any digging project, call the local One-Call system in your area and any utility company that does not subscribe to the One-Call system. For areas not represented by One-Call Systems International, contact the appropriate utility companies or national regulating authority to locate and mark the underground installations. If all utilities are not properly located, you may have an accident or suffer injuries; cause interruption of services; damage the environment; or, experience job delays.

The One-Call representative will notify participating utility companies of your proposed digging activities. Utilities will then mark their underground facilities by using the following international marking codes:

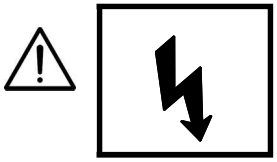
Red	Electric	Green/Brown	Sewer
Yellow	Gas, oil, or petroleum	White	Proposed excavation
Orange	Communication, telephone, TV	Pink	Surveying
Blue	Potable water		

OSHA CFR 29 1926.651 requires that the estimated location of underground utilities be determined before beginning excavation or underground drilling operation. When actual excavation or bore approaches an estimated utility location, the exact location of the underground installation must be determined by a safe, acceptable, and dependable method. If utility cannot be precisely located, it must be shut off by the utility company.

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Striking a Utility

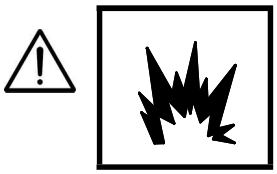
Electricity



DANGER: Electric shock can kill. If strike occurs, stay on machine. Have someone who is clear of the area contact the utility company to shut off electrical power. Do not allow anyone to approach the machine.

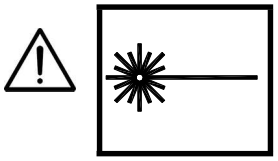
Some circuit breakers automatically reset. Do not assume power has been permanently disconnected until you confirm that the utility company has locked out power to that line.

Gas



DANGER: Gas explosion can kill. If you strike a gas line, shut off engine and evacuate area immediately. Contact utility company and do not return until the utility company gives permission to do so.

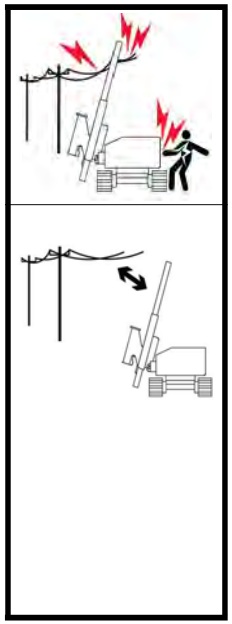
Fiber Optic



WARNING: Laser light may damage eyes. Do not look into the end. Fiber optic cables carry laser light which may damage your eyes. If you are not sure what kind of cable it is, do not look into the end. Contact appropriate utility company for assistance.

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Electrical Shock Protection



DANGER: Electrocution hazard exists around an energized overhead power line. If equipment gets near or contacts energized overhead power line, all connected equipment and surrounding ground surface will be energized. Death or serious injury will result due to electrocution.

Keep machine away from energized overhead power lines according to chart below.

Voltage, kV	Minimum Clearance Distance, ft (m)
up to 50	10 (3.1)
>50 to 200	15 (4.6)
>200 to 350	20 (6.1)
>350 to 500	25 (7.7)
>500 to 750	35 (10.7)
>750 to 1000	45 (13.8)

If arcing or contact occurs, do the following:

- If on machine, stay on machine. Anyone on ground should shuffle away keeping feet close together and on the ground.
- Contact utility company to shut off electrical power.
- Do not allow anyone to approach the machine or any connected equipment.
- Do not resume operation until utility company declares area safe.

The 10 ft machine reaches a maximum height of 179 in (4.6 m). The 15 ft machine reaches a maximum height of 239 in (6.1 m). The 20 ft machine reaches a maximum height of 299 in (7.6 m). ***Maximum machine height may increase if a compatible third-party GPS system is installed.***

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Electrocution Prevention

Electrocution is possible. Death or serious injury may result if the pile being driven strikes an energized power line. Refer to the operating instructions, and take the following precautions to prevent electrocution:

- Call your One-Call system, and any utility company that does not subscribe to the One-Call system, before your project begins. Locate underground utilities by qualified persons. Refer to *page 40-8.*
- When operation approaches the estimated location of a utility, determine the exact location of the underground installation by safe and acceptable means.
- Never step onto or off the machine if electrical strike occurs. You may hear popping/electrical noises or see smoke or sparks if an electrical strike occurs.

If a strike occurs while you are touching the ground, you could be electrocuted when your body becomes a direct current path to the ground.

Jobsite Assessment

Examine work area for obstructions, conditions, or situations which may impair machine operation or create a safety hazard. Use information in this manual and your own good judgment when identifying these hazards and implementing hazard prevention measures.

Check for steep slopes, banks, overhangs, drop-offs, and trenches, which can cave in.

The operator or job foreman should also inspect the jobsite for:

- Holes, rocks, or other hidden hazards
- Traffic/Site access

Remove any obstacles or materials that could result in injury or damage the machine.

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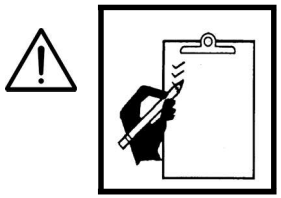
Power Line Locator System

A locator system to locate underground power lines is not included with the system but may be purchased from Vermeer dealerships.

Laws and Regulations – Check

Understand and follow all federal, state, and local laws and regulations that apply to the current job.

Preparing the Machine



WARNING: Check machine before operating. Machine must be in good operating condition and all safety equipment installed and functioning properly.

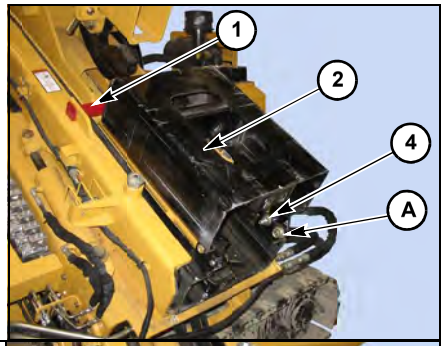
- Ensure you understand and comply with all jobsite rules that might apply to your work situation.
- Adjust seat for best access to controls.
- If operating along a road, properly alert and divert motor and pedestrian traffic. Use all necessary signs, cones, flag persons, or lighting devices needed for the work situation.
- Clean machine to help ensure good operating condition. Refer to *page 60-66.*

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Preparing the Mast

Machine With 10-ft Mast

Additional steps may be required if a compatible third-party GPS system is installed.



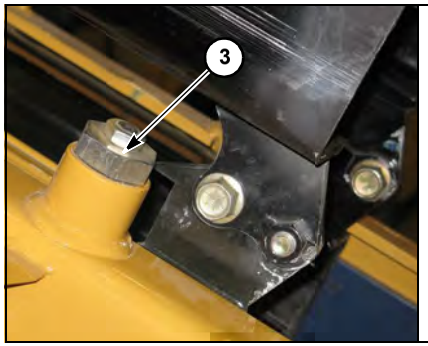
Step 1: Tilt mast to upright position.

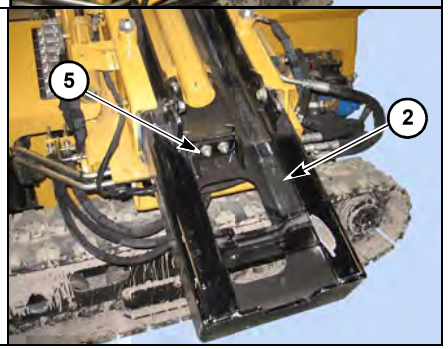
Step 2: Lower mast fully.

NOTICE: If mast is raised too high with bottom section folded, lower mast adjusters **(3)** could fall out of holders.

Step 3: Raise hammer.

Step 4: Install hammer support bar **(1)** in bracket.





Step 5: Lower hammer to contact hammer support bar.

Step 6: Loosen bolts at hinge **(A)** to allow mast to fold while keeping hinge together.

Step 7: Remove bolts **(4)** and fold down bottom section **(2)**.

Depending on size of guide installed, the hammer may need to be raised slightly for clearance when folding bottom section. Lower hammer to contact support bar before installing bolts in holes **(5)**.

Step 8: Install bolts in holes **(5)** and torque to 212 ft-lb (287 Nm).

Step 9: Torque bolts at hinge to 150 ft-lb (203 Nm).

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Machine With 15-ft Mast

Additional steps may be required if a compatible third-party GPS system is installed.

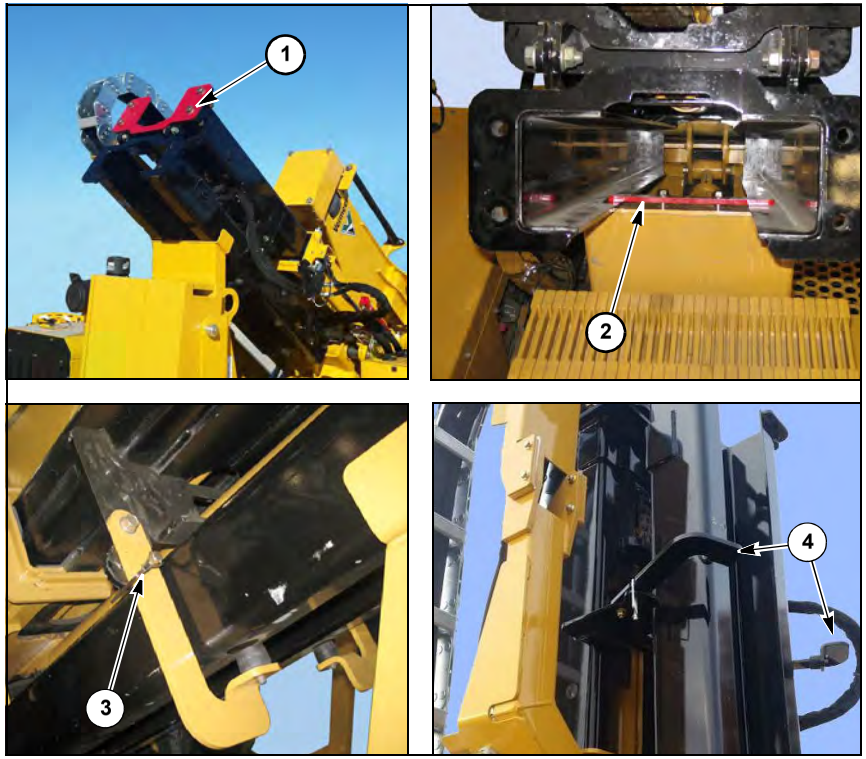
Step 1: Remove four bolts and mast cap plate **(1)**. Retain in toolbox for use during transport.

Step 2: Remove bolts and lock plate **(2)**. Retain in toolbox for use during transport.

Step 3: Tilt mast to the upright position.

Step 4: Remove linchpins **(3)** in locks.

Step 5: Swing out locks **(4)**. Insert linchpins to hold locks open.



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Step 6: Attach suitable lifting device **(5)** to top of mast. Top section of 15-ft mast weighs 190 lb (86 kg).

Step 7: Raise lifting device until top of mast clears cradle **(12)**.

Step 8: Simultaneously tilt mast toward machine and adjust lifting device until hinge is within reach.

Step 9: Insert four longer bolts **(6)** retained in toolbox and tighten. Torque to 376 ft-lb (510 Nm).



Step 10: Remove lifting device.

Step 11: Tilt mast until it is slightly toward machine from vertical.

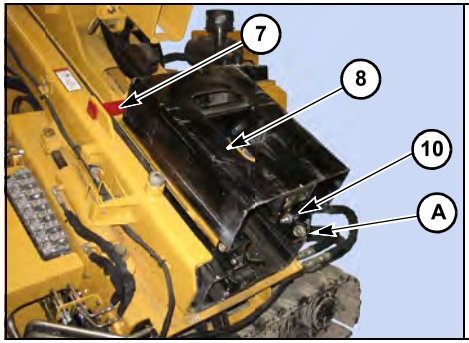
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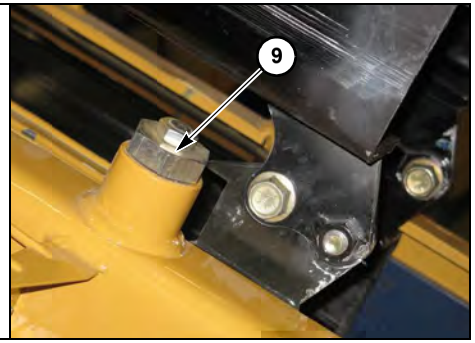
Step 12: Completely lower mast to allow bottom section **(8)** to pivot at hinge **(A)**.

NOTICE: If mast is lifted too high with bottom section folded, lower mast adjusters **(9)** could fall out of holders.

Step 13: Ensure hammer support bar **(7)** is installed.

Step 14: Loosen bolts at hinge to allow mast to fold.



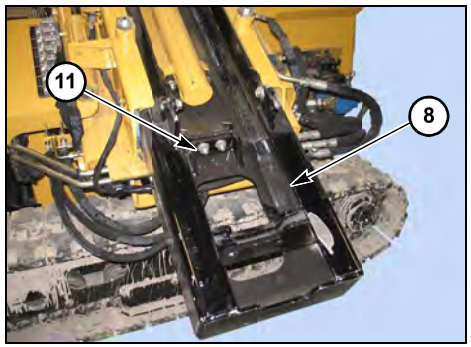


Step 15: Remove bolts **(10)** and unfold bottom section of mast.

Depending on size of guide installed, the hammer may need to be raised slightly for clearance when folding bottom section. Lower hammer to contact support bar before installing bolts in holes **(11)**.

Step 16: Install bolts in holes **(11)** and torque to 212 ft-lb (287 Nm).

Step 17: Torque bolts at hinge to 150 ft-lb (203 Nm).



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Machine With 20-ft Mast

Raise hose carrier if it has been folded for transport. Proceed to Step 5 if hose carrier was not folded.

Step 1: Remove transport straps **(1)**.

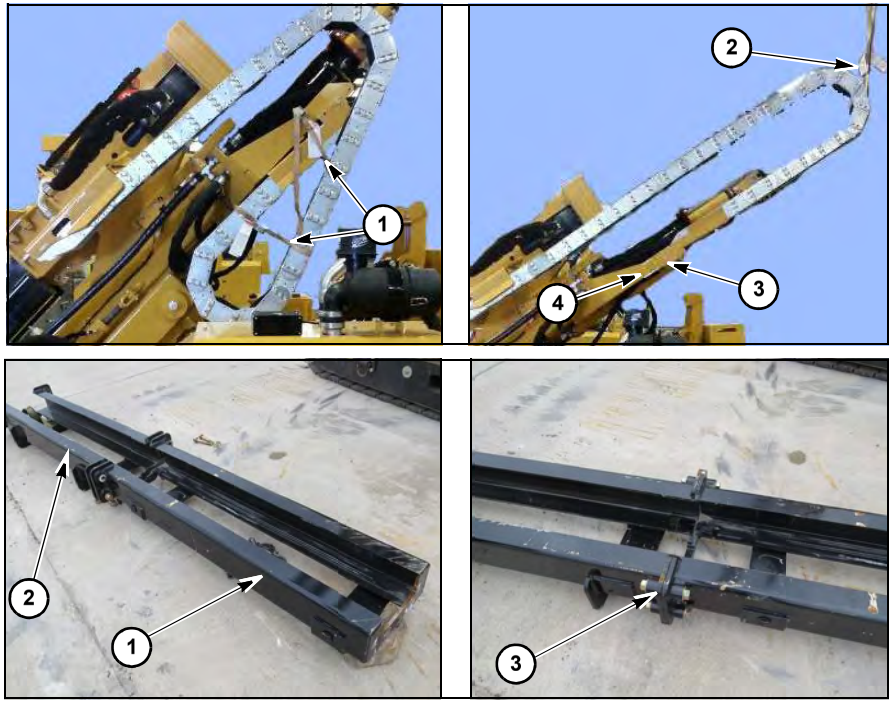
Step 2: Attach suitable lifting device to hose carrier **(2)**. This portion of hose carrier weighs 500 lb (227 kg).

Step 3: Unfold hose carrier.

Step 4: Install bolts **(3)** and tighten bolts **(4)**.

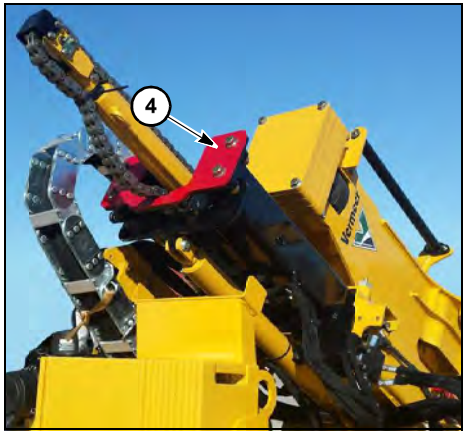
Additional steps may be required if a compatible third-party GPS system is installed.

Step 5: Attach top **(1)** and middle **(2)** portions of mast together. Torque bolts **(3)** to 376 ft-lb (510 Nm).

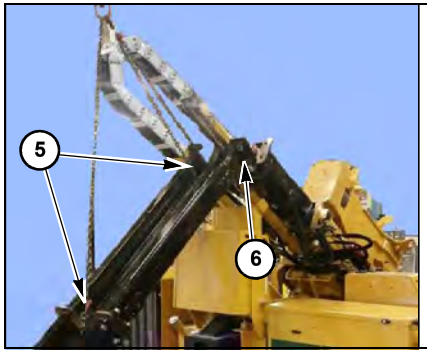


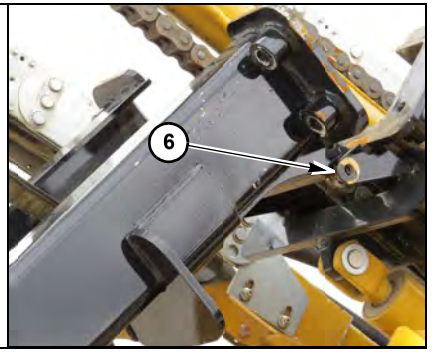
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Step 6: Remove bolts and mast cap plate **(4)** on lower portion of mast. Retain in toolbox for use during transport.



Step 7: Attach suitable lifting device to top two sections of mast at two points **(5)** and align with hinge bolt holes **(6)** on machine. Top two sections of mast weigh 380 lb (172 kg) combined.





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Step 8: Install bolts **(7)** into hinge and tighten to retain joint, but allow mast to unfold.

Step 9: Remove lifting device connection near hinge.

Step 10: Raise top two mast sections to align with bottom section.



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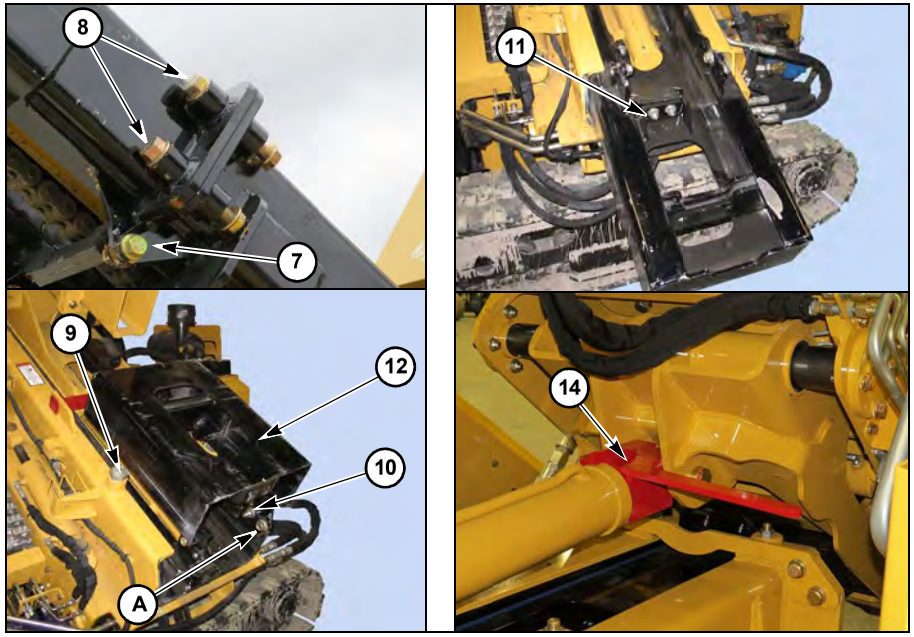
Step 11: Install bolts **(8)**; torque to 376 ft-lb (510 Nm).

Torque bolts **(7)** to 150 ft-lb (203 Nm)

Step 12: Remove lifting device.

Tilt mast out of cradle and away from machine until mast is almost vertical.

NOTICE: If mast is lifted too high with bottom section folded or removed, lower mast adjusters **(9)** could fall out of holders.



Step 13: Ensure hammer support bar is installed.

Step 14: If equipped, remove mast tilt positioner **(14)**, then proceed to step 15.

If not equipped with a mast tilt positioner, proceed to step 18.

Step 15: Loosen bolts at hinge **(A)** to allow bottom section of mast **(12)** to pivot.

Step 16: Remove bolts **(10)** and unfold bottom section of mast

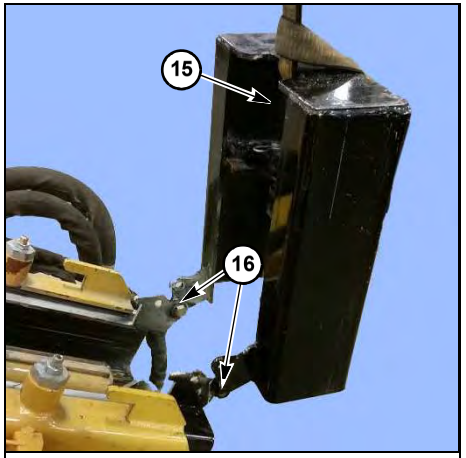
Depending on size of guide installed, hammer may need to be raised slightly for clearance when folding bottom section. Lower hammer to contact support bar before installing bolts in holes **(11)**.

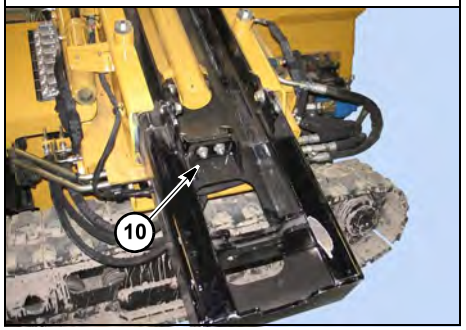
Step 17: Install bolts **(10)** in holes **(11)**, torque to 212 ft-lb (287 Nm).

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Step 18: Attach bottom section of mast:

- Lower mast completely.
- Attach suitable lifting device to bottom section of mast **(15)**. Bottom section weighs 85 lb (39 kg).
- Lift bottom section of mast into position.
- Install bolts **(16)** so that bottom section can pivot.
- Unfold bottom mast section into work position, then tighten bolts and remove lifting device.
- Install bolts **(10)** that were stored during transport. Torque to 212 ft-lb (287 Nm).





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Mounting Compatible Third-party GPS System

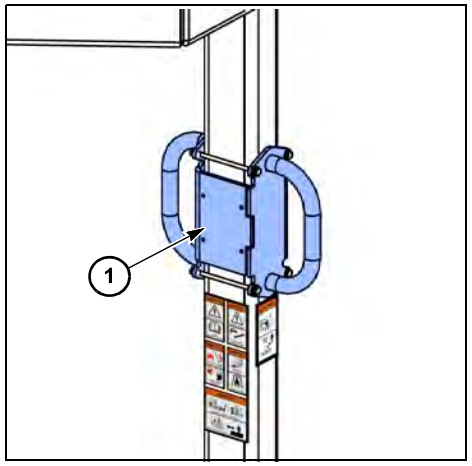
Mounting accommodations have been provided for the owner's convenience in mounting a compatible third-party GPS system. Vermeer makes no representation as to the compatibility of any third-party GPS system.

Display

(1) Mounting location

Mounting location has standard VESA 1/4-20 UNC threaded hole pattern. Use only holes provided to mount display. Do not drill or weld on the ROPS bar. Unauthorized modifications of the ROPS could weaken the structure and reduce protection. Refer to "Rollover Protective Structure (ROPS)," *page 30-3.*

Display must not block operator's view of pile installation process. If necessary, reposition display to rotate operator's station, or to improve walkway access.



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Antenna

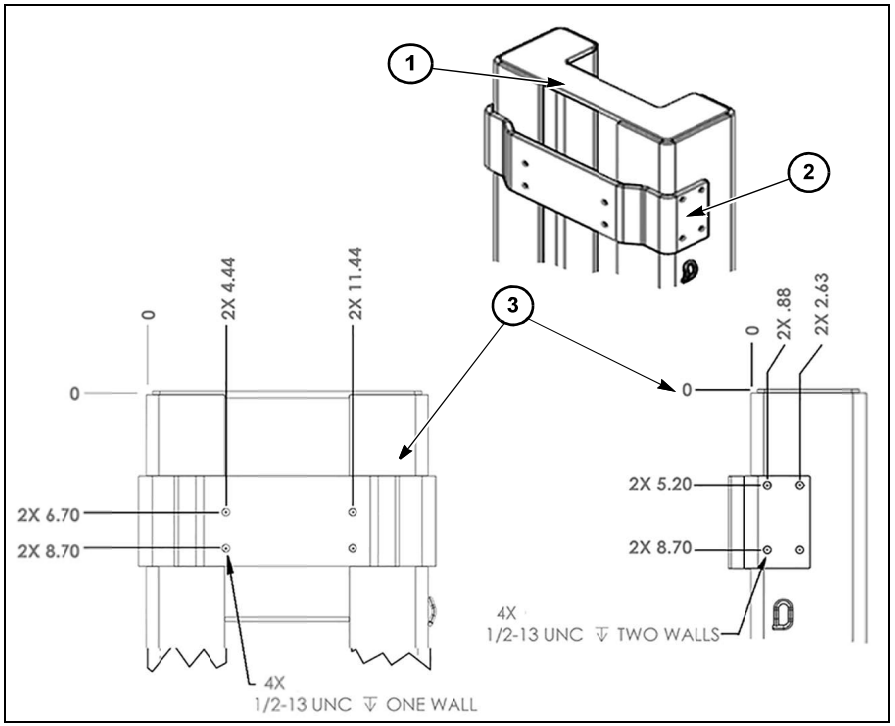
An antenna can be attached to the mast. Refer to compatible third-party GPS Operator's Manual for more information.

(1) Top of mast

(2) Bracket

(3) Bolt hole specifications

NOTICE: Use bolts that will not protrude through mast and interfere with hammer carriage when fully raised.



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Compartment

The lockable compartment **(1)** provides a mounting location **(2)** with pre-drilled holes for a receiver or battery, a 12-pin electrical connector **(3)** and storage for components.

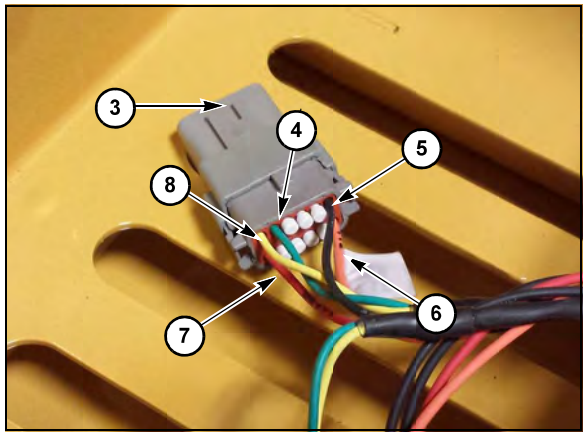
(4) CAN low

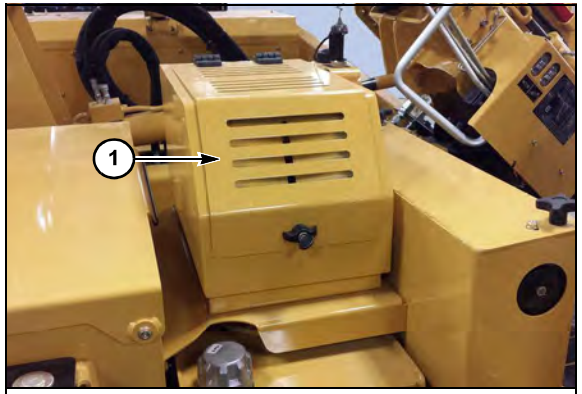
(5) Ground

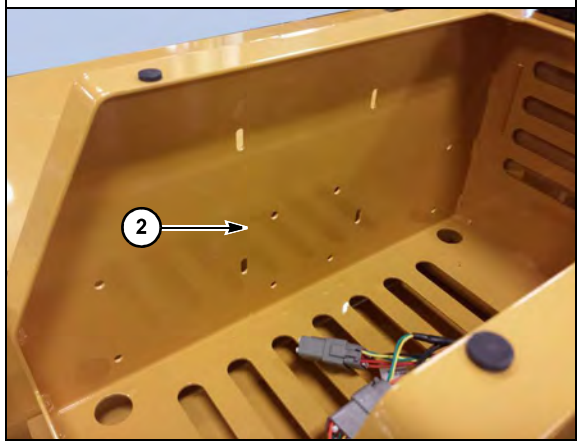
(6) 12V power, switched

(7) 12V power, unswitched

(8) CAN high







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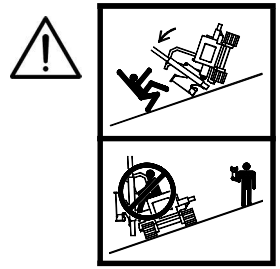
Section 50: Operating the Machine



WARNING: Read Operator's Manual and safety signs, and watch the operations and safety video, before operating machine.

Familiarize yourself with the location and function of the controls before operating. Refer to "Controls," *page 20-1.*

Rollover Possible



WARNING: Rollover can crush.

Stay uphill.

No riding.

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WARNING: Rollover can crush.

Fasten seat belt.

Take precautions to prevent rollover.

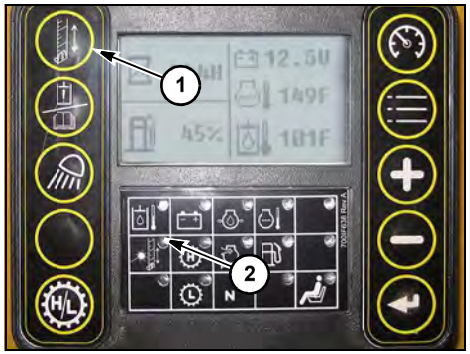
- Do not operate on slopes where rollover could occur.
- Do not operate near large holes, ditches, steep banks, or other terrain that may cause the machine to tip sideways.
- Operate at speeds and in a manner consistent with terrain and operating conditions.
- Before driving or operating machine, survey area around machine for persons or obstacles.

Driving Piles Using Operator's Station

This procedure requires a second person to handle piles.

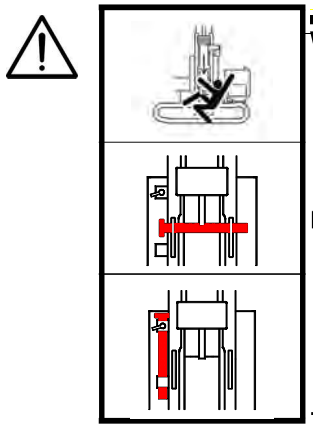
Step 1: Press *measure mode key* **(1)** to select desired mode based on machine configuration. Refer to "Measure Mode Selections," *page 20-25.*

Measure mode light **(2)** will come on when an automatic measure mode is selected.



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Step 2: Tilt mast to vertical with switch **(3)** and joystick. Refer to *page 20-14.*



WARNING: Falling hammer can crush.

Engage support before working on or under hammer.

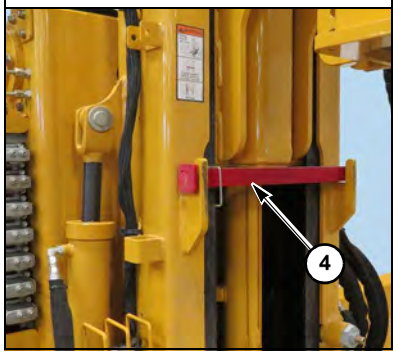
Storage

Step 3: Ensure hammer support bar **(4)** is installed and supporting hammer.

Step 4: If necessary, install hammer support bar and lower hammer to contact support bar.

Step 5: Shut down engine and remove key.





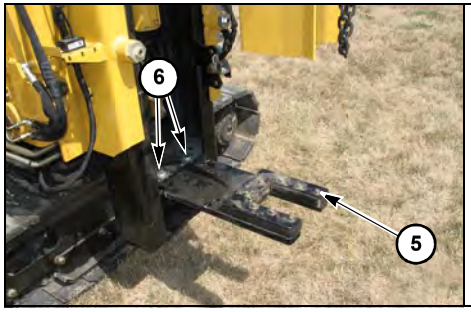
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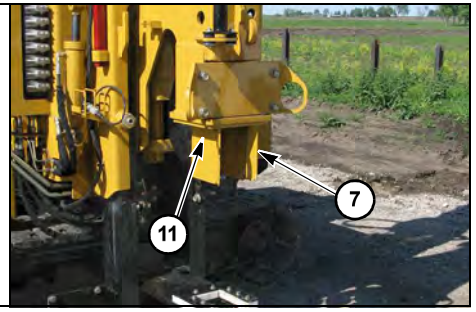
Step 6: Attach lower guide plate **(5)** with pins and hairpins **(6)**.

Step 7: Attach upper guide **(7)** with bolts **(11)**.

Step 8: Follow *Starting Procedure,* page *22-1.*

Step 9: Raise hammer slightly to remove hammer support bar. Stow bar.

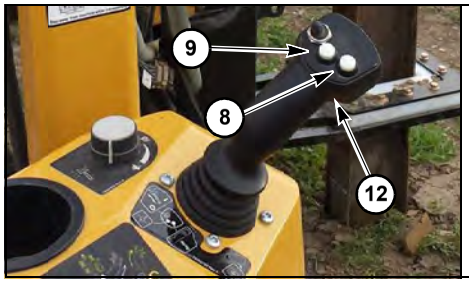


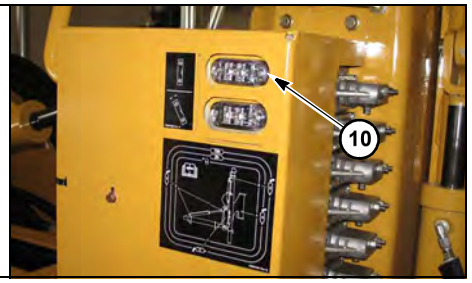


Step 10: Engage auto home mast slide **(9)** (if equipped) to provide a consistent starting point.

Step 11: Position machine and mast. Leave enough mast slide travel to disengage lower guide plate **(5)** from the pile after the pile is driven if side load guide is used.

Guides **(5)** & **(7)** can be changed depending on pile size and shape.





Step 12: Lower hammer on mast.

Step 13: Engage auto plumb **(8)** to fine-tune the mast position.

If green light **(10)** is on, mast is within plumb tolerance range.

Activating auto plumb with hammer raised may make the mast sway, which may result in a slower cycle time. Activating auto plumb with the hammer raised may also decrease machine stability.

Step 14: Engage GPS auto target **(12)**, if equipped with compatible third-party GPS system.

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If using a lifting device to help position pile:

- Select a device that is correct for the type of pile being driven. Consider weight, shape, and material composition.
- Inspect lifting device throughout the day, and repair or clean, as necessary.
- Do not lift the pile overhead or off the ground more than necessary.
- Position pile before lifting so that top end is pointing away from all personnel.
- Attach lifting device above midpoint of pile so that pile is lifted upright to facilitate installation.

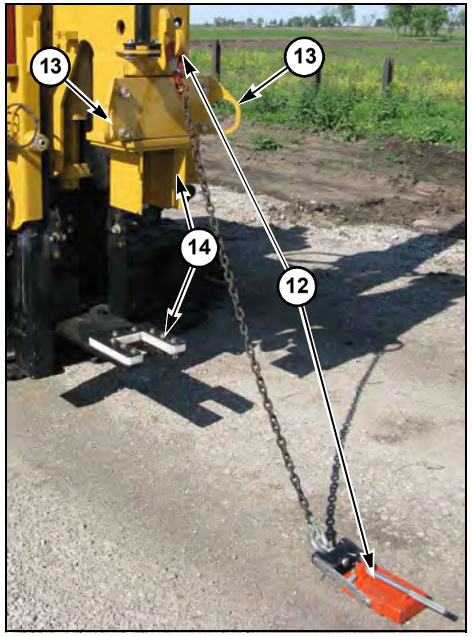
If using a magnet to lift the pile:

- Remember that the magnet will be lifting in shear (reduced capacity). Use only a magnet specifically designed for this type of lifting. Follow magnet manufacturer's instructions for safe lifting.
- The magnet's lifting capability depends on several factors, including pile weight, material type, material thickness, coatings, and cleanliness.
- Pile and magnet must be dry and free of ice, dirt, foliage, and debris. The magnet must be in full contact with the surface of the pile being lifted.

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Step 15: If using a lifting device, attach lifting device **(12)** to pile and location on machine as shown.

Lifting device can be routed through one of the guide loops **(13)** to help direct pile into position. Do not attach lifting device to guide loops.

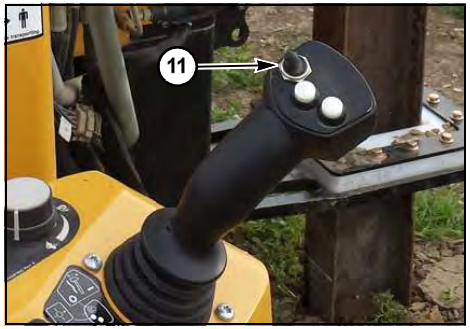


WARNING: Falling loads can result in death or serious injury. Do not exceed rated lift capacity of lifting device.

Step 16: Raise hammer by pulling back on right joystick, while second person helps guide pile into position.

Step 17: Insert pile into upper and lower guides **(14)**.

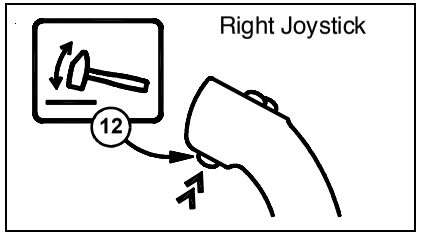
Step 18: Slowly lower hammer onto the pile, and turn hammer FLOAT on with switch **(11)**.



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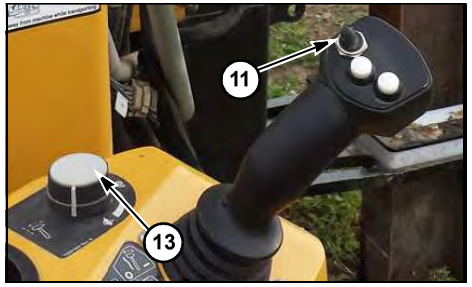
Step 19: Start hammer with *hammer on/off switch* **(12)** on back of right joystick.

- If using a measure mode with elevation, and a laser receiver or compatible third-party GPS system with an elevation component is installed and functional, hammer blows stop when hammer reaches the preset elevation.
- If using a manual measure mode, press *switch* **(12)** again to stop hammer when correct height is reached.



Step 20: If necessary to prevent interference, remove lifting device before pile is fully driven.

Step 21: If a single strike is needed, adjust *dial* **(13)** to lower hammer speed. Start with 50% until you are more experienced.



Step 22: Press and hold *switch* **(15)** until hammer strike occurs.

Step 23: Disengage hammer float with *switch* **(11)**.

Step 24: If necessary, remove lifting device from pile and step away from machine.

Step 25: When pile reaches desired height, lift hammer high enough to clear pile.

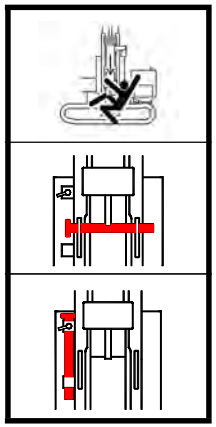
Step 26: If using side load guide, slide mast toward machine until lower guide is clear of pile.

Step 27: Move machine to next position.



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Extracting Piles Using Operator's Station



WARNING: Falling hammer can crush.

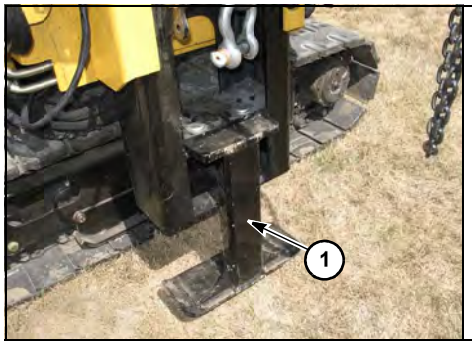
Engage support before working on or under hammer.

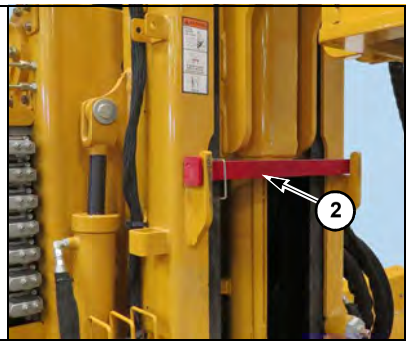
Storage

Step 1: Adjust mast height and hammer height so that extraction foot **(1)** and hammer support **(2)** can be installed.

Step 2: Install hammer support bar **(2)** and lower hammer onto bar.

Step 3: Shut down engine and remove key.





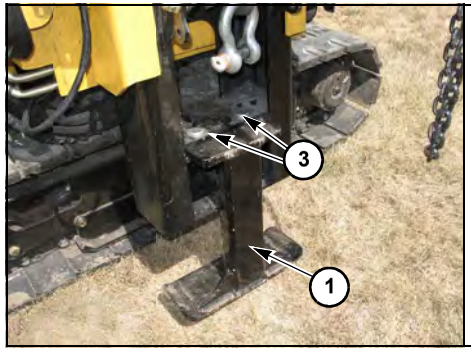
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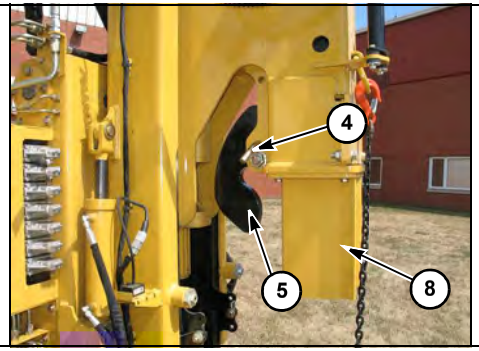
Step 4: Install extraction foot **(1)** and secure with pins **(3)**.

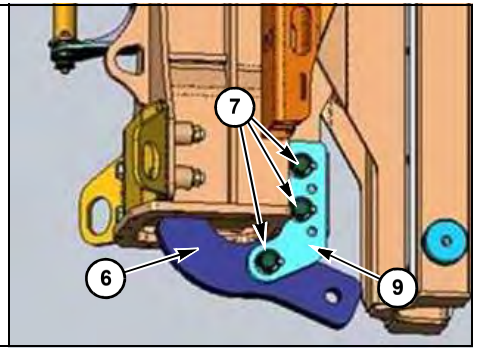
WARNING: Plate **(5)** is heavy and will swing down when pin **(4)** is removed. Keep hand away from leading edge of plate when removing pins, or crushing injury may result.

Step 5: **Smaller opening hammer box:** Remove linchpin and pull pin **(4)** to allow plate **(5)** to swing down to position shown in center photo. Store pin **(4)** in same hole.

Larger opening hammer box: Remove upper guide **(8)**. Install plate **(6)** and bracket **(9)** (stored in toolbox) with pins **(7)**. Secure pins with quick release pins.







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Step 6: Insert shackle **(10)** with clamp **(11)** (or other appropriate coupling device) into plate **(5)**.

Shackles bear significant shock loading due to impact. Use correctly sized shackles. Shackles and clamp are not provided. Appropriate clamping device varies, depending on pile type, size, and shape.

Step 7: Follow *Starting Procedure,* page *22-1.*

Step 8: Raise hammer slightly to remove hammer support bar. Stow bar.

Step 9: Position clamp above pile.

Step 10: Lower mast until extraction foot touches the ground.

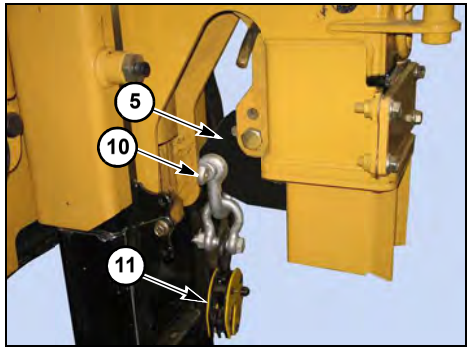
Step 11: Lower hammer until clamp can attach to top of pile.

Step 12: Shut down engine and remove key.

Step 13: Attach clamp to pile.

Step 14: Follow *Starting Procedure,* page *22-1.*

Step 15: Slowly lift hammer until clamp locks onto pile and is tensioned.



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Step 16: Slowly lift hammer by pulling on right joystick.

Step 17: Activate the hammer with *momentary hammer engage switch* **(12)**.

Step 18: Stop hammer percussion when pile becomes easy to extract, and continue to extract with hammer lift.

Step 19: Tilt pile away from all personnel and lower hammer until pile is on the ground.

- If pile is light enough, the ground crew can assist with lower end of the pile as hammer is lowered.
- If pile is too heavy or very long, drive the machine rearward so the top of the pile is lowered away from the operator. Always drive machine in direction that prevents piles from lowering towards personnel.

Step 20: Remove clamp.

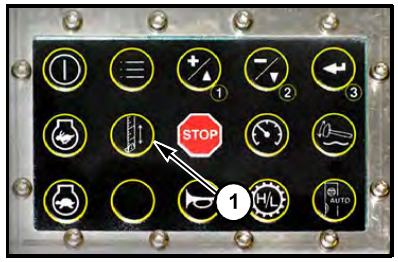


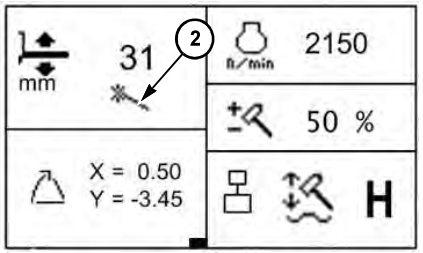
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Driving Piles Using Remote Control (Option)

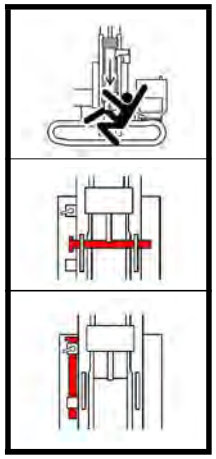
Step 1: Press *measure mode key* **(1)** to select desired mode based on machine configuration. A symbol **(2)** will appear on screen (varies by measure mode selected).

Step 2: Tilt mast to vertical with key **(3)** and joystick **(4)**.









WARNING: Falling hammer can crush.

Engage support before working on or under hammer.

Storage position.

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Step 3: Tilt mast to vertical with key **(3)** and joystick **(4)**. Adjust hammer height with right joystick so hammer support bar **(5)** can be installed.

Step 4: Install hammer support bar **(5)** and lower hammer to contact bar.

Step 5: Shut down engine and remove key.

Step 6: Attach lower guide plate **(6)** with pins and hairpins **(7)**.

Step 7: Attach upper guide **(8)** with bolts **(9)**.

Step 8: Follow *Starting Procedure,* page *22-1.*

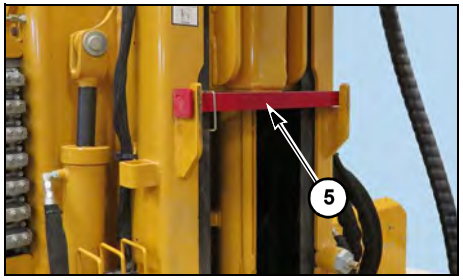
Step 9: Raise hammer slightly to remove hammer support bar. Stow bar.

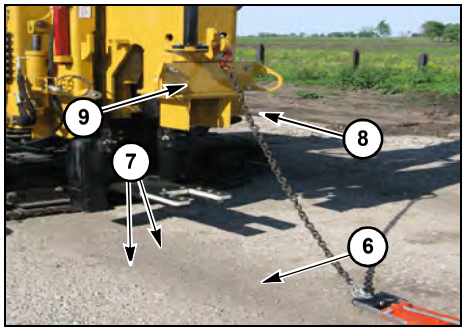
Step 10: Engage auto home mast slide **(10)** (if equipped) to provide a consistent starting point.

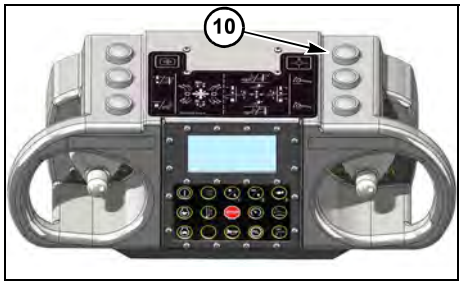
Step 11: Position machine and mast. Leave enough mast slide travel to disengage lower guide **(6)** from the pile after the pile is driven.

Upper guide and lower guide can be changed depending on pile size and shape.

Step 12: Lower hammer on mast.







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Step 13: Engage auto plumb **(11)** to fine-tune mast position.

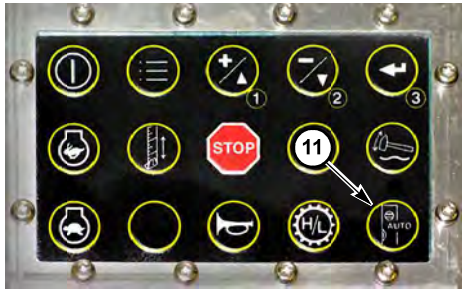
When green light **(12)** is on, mast is within plumb tolerance range. Refer to "Mast Plumb Lights," *page 20-17.*

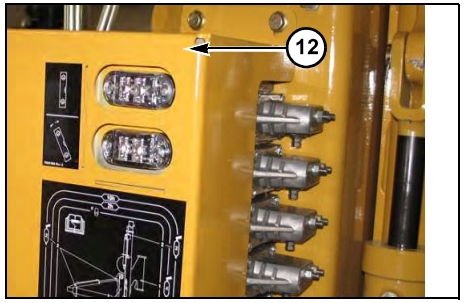
NOTICE: Activating auto plumb with hammer raised may make the mast sway, which may result in a slower cycle time. Activating auto plumb with the hammer raised may also decrease machine stability.

Step 14: Engage GPS auto target **(13)** (if equipped with a compatible third-party GPS system).

If using a lifting device to help position pile:

- Select a device that is correct for the type of pile being driven. Consider weight, shape and material composition.
- Inspect lifting device throughout the day and repair or clean, as necessary.
- Do not lift the pile overhead or off the ground higher than necessary.
- Position pile before lifting so that top end is pointing away from all personnel.
- Attach lifting device above midpoint of pile so that pile is lifted upright to facilitate installation.







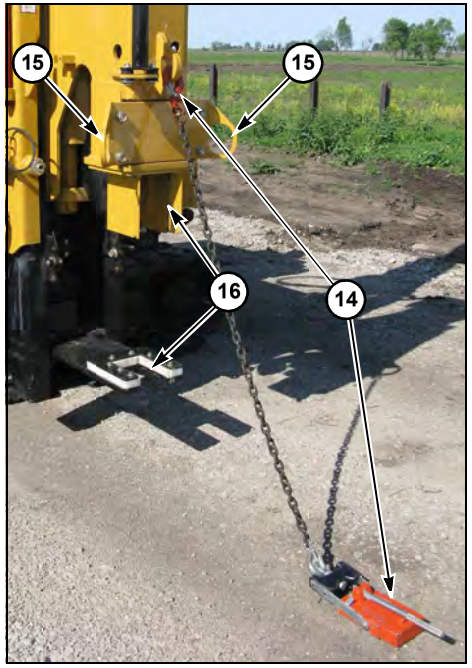
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If using a magnet to lift the pile:

- Remember that the magnet will be lifting in shear (reduced capacity). Use only a magnet specifically designed for this type of lifting. Be sure to follow magnet manufacturer's instructions for safe lifting.
- The magnet's lifting capability depends on several factors, including pile weight, material type, material thickness, coatings, and cleanliness.
- Pile and magnet must be dry and free of ice, dirt, foliage, and debris. The magnet must be in full contact with the surface of the pile being lifted.

Step 15: If a lifting device is being used, attach lifting device **(14)** to pile and location on machine as shown.

Lifting device can be routed through one of the guide loops **(15)** to help direct pile into position. Do not attach lifting device to guide loops.



WARNING: Falling loads can result in death or serious injury. Do not exceed rated lift capacity of lifting device.

Step 16: Raise hammer by pulling back on right joystick, while second person helps guide pile into position.

Step 17: Insert pile into upper and lower guides **(16)**.

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Step 18: Slowly lower hammer onto the pile and turn *hammer float key* **(17)** ON.

Step 19: Start the hammer with *hammer on/off button* **(18)**.

- If using a measure mode with elevation and a laser receiver or compatible third-party GPS system with an elevation component is installed and functional, the hammer blows stop when it reaches the preset elevation.
- If using a manual measure mode, press key **(19)** again to stop hammer when correct height is reached.
- The main screen displays percent of hammer speed. Refer to “Main Screen,” *page 20-24*.

Step 20: If necessary to prevent interference, remove lifting device before pile is fully driven.

Step 21: If a single strike is needed, adjust *hammer speed dial* **(20)** to lower hammer speed. Start with 50% until you are more experienced.

Step 22: Press and hold button **(21)** until hammer strike occurs.

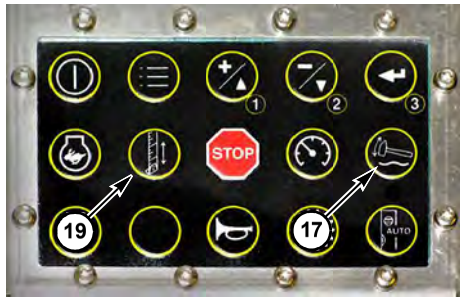
Step 23: Disengage hammer float with key **(17)**.

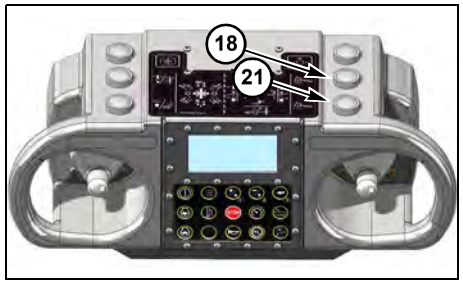
Step 24: If necessary, remove lifting device from pile and step away from the machine.

Step 25: Lift hammer high enough to clear pile.

Step 26: If using side load guide, slide mast toward machine until lower guide is clear of pile.

Step 27: Move machine to next position.

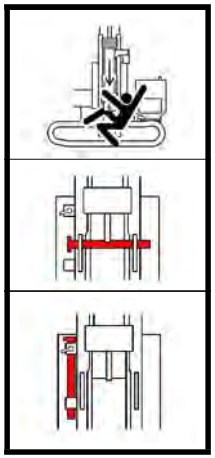






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Extracting Piles Using Remote Control (Option)



WARNING: Falling hammer can crush.

Engage support before working on or under hammer.

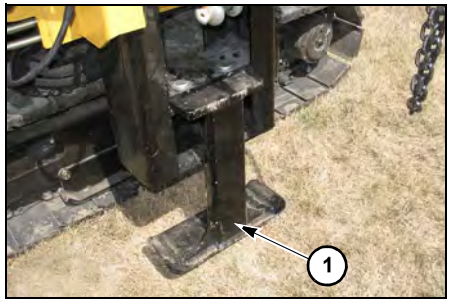
Storage position.

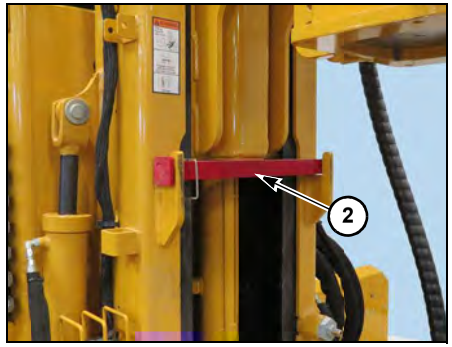
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Step 1: Adjust mast height and hammer height so extraction foot **(1)** and hammer support bar **(2)** can be installed.

Step 2: Install hammer support bar **(2)** and slowly lower hammer onto bar.

Step 3: Shut down engine and remove key.





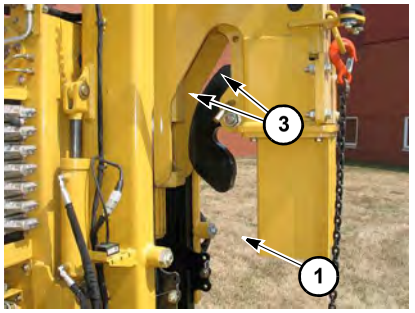
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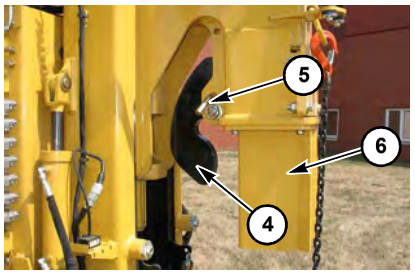
Step 4: Install extraction foot **(1)** and secure with pins **(3)**.

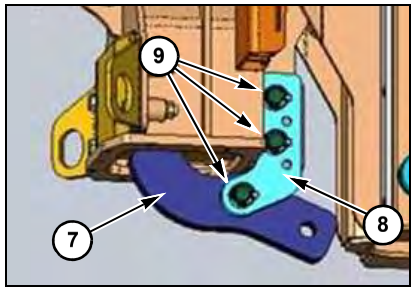
WARNING: Plate **(4)** is heavy and will swing down when pin **(5)** is removed. Keep hand away from leading edge of plate when removing pins, or crushing injury may result.

Step 5: **Smaller opening hammer box:** Remove linchpin and pull pin **(5)** to allow plate **(4)** to swing down to position shown in center photo. Store pin in same hole.

Larger opening hammer box: Remove upper guide **(6)**. Install plate **(7)** and bracket **(8)** (stored in toolbox) with pins **(9)**. Secure pins with quick-release pins.







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Step 6: Insert shackle **(10)** with clamp **(11)** into plate **(12)**.

Shackles experience significant shock loading due to impact. Use correctly sized shackles. Shackles and clamp are not provided. Appropriate clamping device varies, depending on pile type, size, and shape.

Step 7: Follow *Starting Procedure,* page *22-1.*

Step 8: Raise hammer slightly to remove hammer support bar. Stow bar.

Step 9: Position clamp above pile.

Step 10: Lower mast until extraction foot touches the ground.

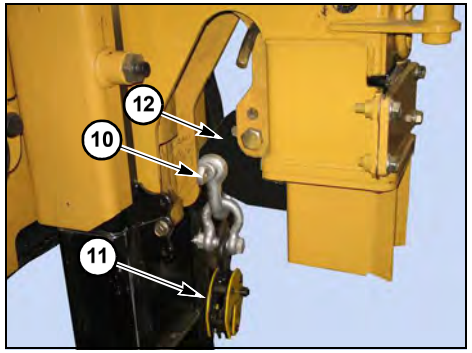
Step 11: Lower hammer until clamp can attach to top of pile.

Step 12: Shut down engine and remove key.

Step 13: Attach clamp to pile.

Step 14: Follow *Starting Procedure,* page *22-1.*

Step 15: Slowly lift hammer until clamp locks onto pile and is tensioned.



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Step 16: Slowly lift hammer by pulling on right joystick. Activate the hammer with the *hammer momentary on button* **(13)**.

Step 17: Stop hammer percussion when pile becomes easy to extract, and continue to extract with hammer lift.

Step 18: Tilt pile away from all personnel and lower hammer until pile is on ground.

- If pile is light enough, the ground crew can assist with moving lower end of pile as hammer is lowered.
- If pile is too heavy or very long, drive machine rearward so top of pile is lowered away from operator. Always drive machine in direction that prevents pile from lowering toward personnel.

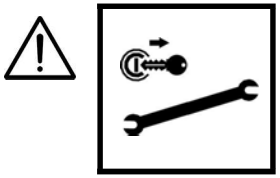
Step 19: Remove clamp.



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Section 60: Maintenance



WARNING: Failure to use shutdown procedure can result in unexpected hazard(s). Death or serious injury could result due to entanglement, crushing, cutting, or other hazardous contact. Follow Shutdown Procedure after operating, before performing any service or maintenance, and before transporting. Refer to *Shutdown Procedure, page 23-1*.

Visually inspect machine daily before starting the machine.

Make no modifications to your equipment unless specifically recommended or requested by Vermeer Corporation.

Properly maintain condition of all safety signs. Refer to *page 60-23.*

Avoid damaging components when cleaning machine. Refer to *page 60-66.*

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Welding Alert – Electronic Components

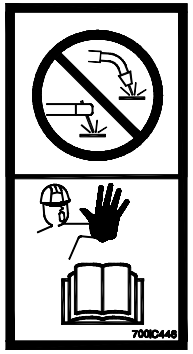
NOTICE: Electronic modules and controllers will be damaged from stray voltages and currents generated during welding if not unplugged ***before welding***.

To prevent extensive and costly damage to the electrical components:

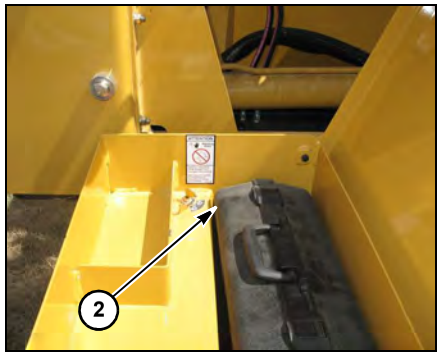
Step 1: Follow *Shutdown Procedure,* page *23-1.*

NOTICE: Wait 60 seconds before disconnecting the battery. This is necessary to allow electronic controllers to complete their respective cycles.

Step 2: Open toolbox **(1)** to access *battery disconnect switch* **(2)**. Turn switch to disconnect.





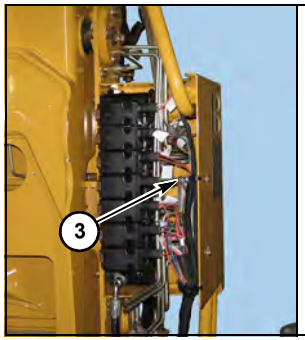


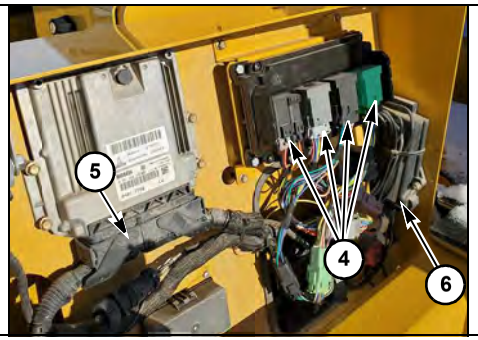
NOTICE: Disconnecting the battery ground with the battery disconnect switch does not prevent damage to the electronic components during welding. Each of the modules must have the electrical connector unplugged.

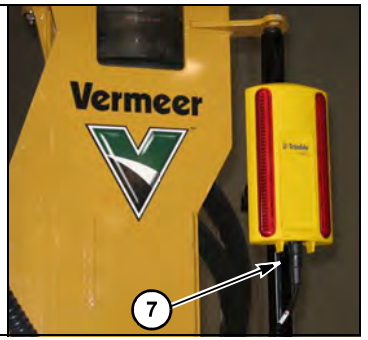
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Step 3: Unplug Sauer Plus 1 output module **(3)**, MC4-24-20 module **(4)**, ECU **(5)**, and if equipped, radio remote base **(6)**.

Step 4: If equipped, unplug laser receiver **(7)**.

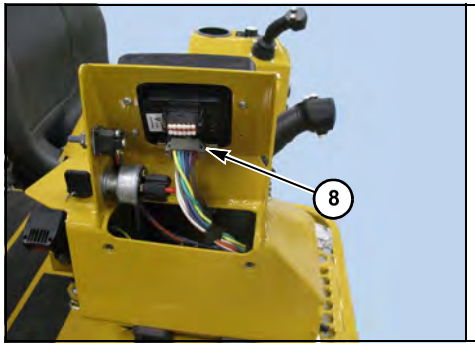


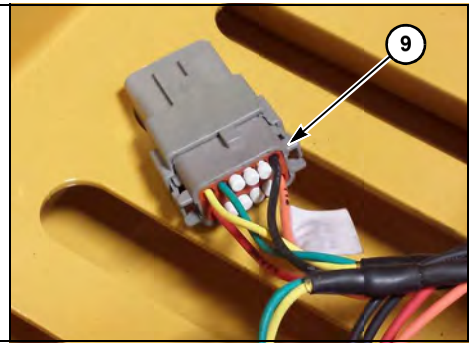




Step 5: Unplug DP10 controller **(8)**.

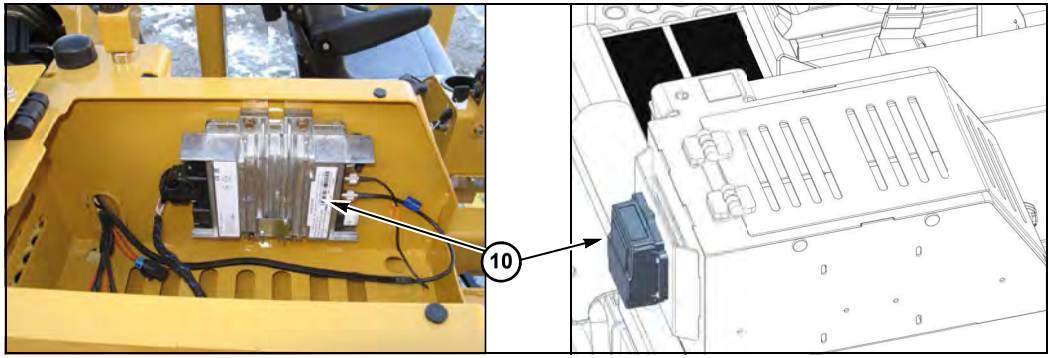
Step 6: If equipped, unplug compatible third-party GPS connection **(9)**.





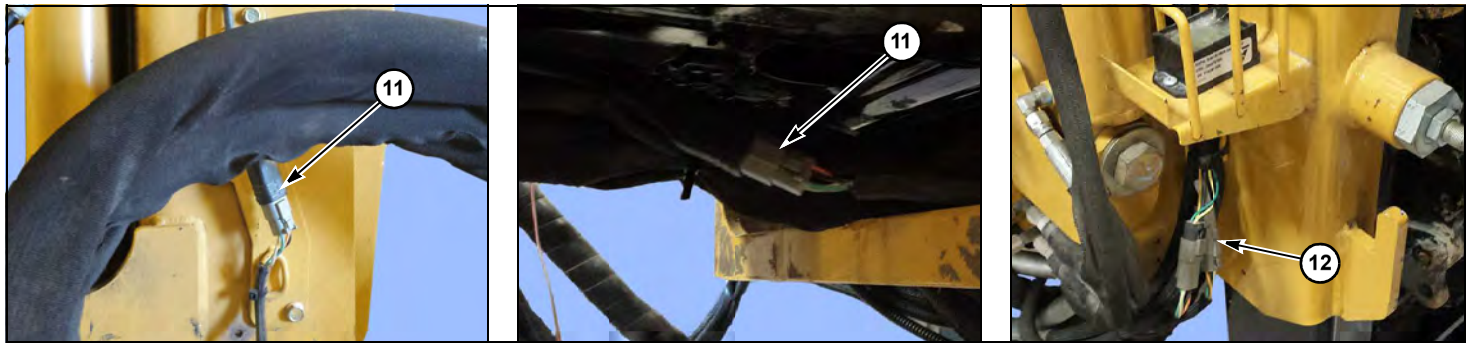
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Step 7: If equipped, unplug telematics control unit connections **(10)**.



Step 8: If equipped, unplug two LVDT sensors **(11)**, and inclinometer connection **(12)**.

Two connections for inclinometer shown. Some machines may be configured with only one inclinometer connection. All inclinometer connections need to be unplugged, regardless of configuration, before welding.



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Engine Maintenance Intervals

Refer to the Engine Operation Manual, supplied with each machine, for maintenance instructions that are not included in this manual. Shorten maintenance intervals when operating under dusty, dirty conditions.

Greasing the Machine

Grease machine after it is shut down for the day. This protects the metal under the seals from corrosion caused by condensation as the temperature drops.

Ensure all fittings and grease applicator nozzle are clean before applying grease. If any grease fittings are missing, replace them immediately.

Recommended Fluids

Refer to “Lubricants,” *page 70-1*, for fluid and lubricant requirements.

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Maintenance Intervals – Hourmeter

The engine display screen is used to determine maintenance intervals for the machine. The display indicates the total number of hours the engine has been in operation. Refer to “Engine Screen,” *page 20-26.*

The maintenance intervals outlined in these maintenance sections are based on normal operating conditions. When operating under severe conditions, shorten the intervals.

Initial = Initial maintenance on new machine. Regular maintenance intervals may be different.

I = Regular maintenance interval.

For Vermeer maintenance replacement part numbers, refer to the parts manual or call your Vermeer dealer.

Service	Maintenance Interval – Service Hours									
	10 or Daily	50 or Weekly	125	250	500	750	1000	1500	2000	As Required
Hammer Point – Grease	●									
Hammer Lift Rollers – Grease	●									
Hammer Lift Roller Nuts and Bolts – Check	●									
Engine – Check for Leaks and Damaged or Missing Parts	●									
Electrical and Hydraulic Components – Check	●									
Engine Oil Level – Check	●									
Hydraulic Oil Level – Check	●									
Coolant Level – Check	●									
Fuel Tank – Fill	●									
Fuel/Water Separator – Check/drain	●									
Mast Tilt Cylinder – Grease	●									
Air Cleaner Restriction Indicator – Check	●									
Wear Pads – Check		●								

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Service	Maintenance Interval – Service Hours									
	10 or Daily	50 or Weekly	125	250	500	750	1000	1500	2000	As Required
Track Planetary Gearbox Oil Level – Check		●								
Safety Signs Maintenance			●							
Overall Machine – Check			●							
Backup Alarm – Check			●							
Controls – Check			●							
Neutral Start Interlock – Check			●							
Indicator Lights – Check			●							
Operator Presence System – Check			●							
Park Brake – Check			●							
Seat Belt Maintenance			●							
Hydraulic System – Check			●							
Hammer Proximity Switches – Check			●							
Ground Drive System – Inspect			●							
Remote Control – Test			●							
Track Pads and Bolt Tension – Check			●							
Track Chain Tension – Check			●							
Percussion Hammer Lifting Chain, Anchor, and Pins – Check/Clean/Lubricate			●							
Engine Oil and Filter – Change				●						
Radiator and Oil Cooler – Clean				●						
Cooling Fan V-belt – Check/Adjust Tension				●						
Governor Lever and Engine Speed Control – Check **(Yanmar Engines Only)**				●						
Hydraulic Filters – Replace (Initial)				Initial						

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Service	Maintenance Interval – Service Hours									
	10 or Daily	50 or Weekly	125	250	500	750	1000	1500	2000	As Required
Fuel Filters – Replace					●					
Primary Air Cleaner Element – Replace					●					
Hydraulic Filters – Replace					●					
Battery Cables and Connections – Check					●					
Battery Connections – Clean					●					
Battery Electrolyte Level – Check					●					
Chain – Inspect					●					
Blunt Tool/Striker Block – Remove and Inspect					●					
Hammer – Disassemble and Inspect (Hammer Hours)						●				
Engine Valve Clearance – Adjust **(Yanmar Engines Only)**							●			
Air Cleaner Elements – Replace							●			
Hydraulic Fluid – Change							●			
Track Planetary Oil – Change							●			
Crankcase Breather Element – Replace								●		
Fuel Injectors – Clean and Test **(Yanmar Engines Only)**								●		
Crankcase Breather System – Inspect **(Yanmar Engines Only)**								●		
Fuel and Engine Coolant Hoses – Check/Replace **(Yanmar Engines Only)**									●	
Intake and Exhaust Valves – Lap **(Yanmar Engines Only)**									●	

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Service	Maintenance Interval – Service Hours									
	10 or Daily	50 or Weekly	125	250	500	750	1000	1500	2000	As Required
SCR Feed Pump Filter Cartridge – Replace									●	
Cooling System – Drain and Clean									●	
Battery – Replace										●
Air Cleaner Element(s) – Replace										●
Wear Pads – Adjust										●
Rollover Protection Structure (ROPS) – Check										●
Track Tension – Adjust										●
Hammer – Service										●
Fuses and Relays – Replace										●
Mast Removal/Assembly										●
Storage Procedure										●
Cleaning the Machine										●

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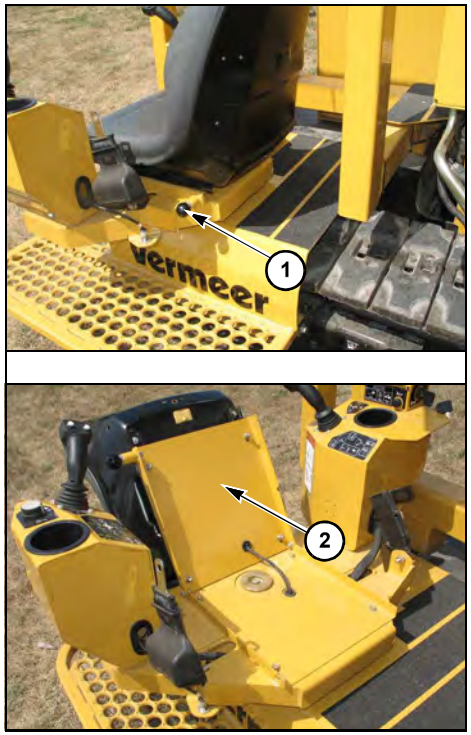
Access to Walkway

Step 1: Rotate seat to transport position.

Step 2: Slide seat fully back toward machine.

Step 3: Pull seat tip lever **(1)** out.

Step 4: Tip seat forward **(2)** to provide access to walkway.



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Every 10 Hours or Daily

Engine – Check

Refer to the Engine Operation Manual supplied with machine for complete information.

Check for:

- Oil leaks
- Fuel leaks
- Coolant leaks
- Damaged or missing parts
- Loose, missing, or damaged fasteners

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Hammer Point – Grease

In harsh environments, grease hourly.

Step 1: Support hammer in one of two ways:

- Lower hammer onto a post that has been driven in to a height that allows access to grease point.
- Lower hammer onto similar device that adequately supports hammer.

Step 2: Place hammer in float.

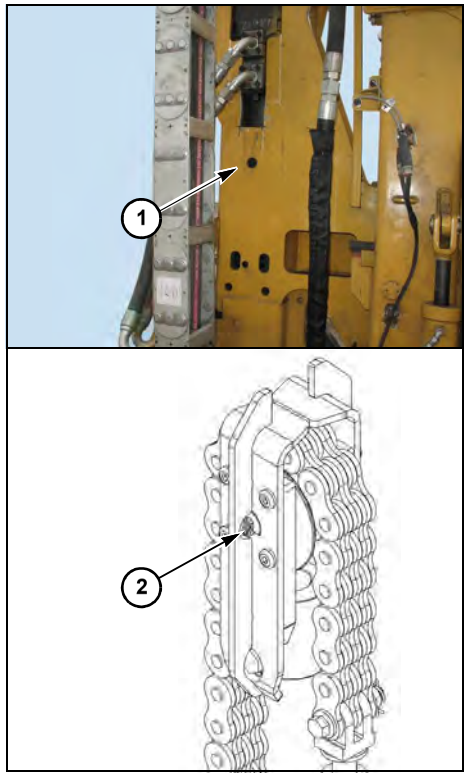
NOTICE: Before and during greasing, fully compress strike plate. Lower seals will be damaged if hammer is greased without full compression of striker plate.

Step 3: Purge fitting **(1)** with chisel paste hammer grease. Refer to “Lubricants,” *page 70-1.*

Step 4: 10-ft and 15-ft Mast: Raise hammer slightly and tilt mast down to access hammer lift roller fitting (2) for two shots of grease.

20-ft Mast: Lower hammer, slide mast out, and tilt mast toward machine to access hammer lift roller fitting **(2)** for two shots of grease.

Refer to “Lubricants,” *page 70-1.*



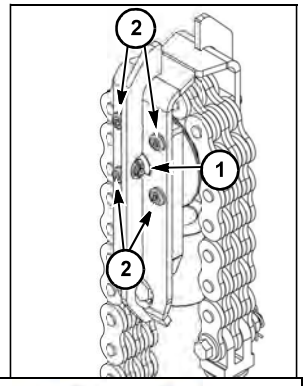
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Hammer Lift Roller – Grease

Step 1: Lower hammer onto support bar or other suitable support.

Step 2: Grease chain roller **(1)**.

Two shots. . . . . two fittings (one fitting on each side).



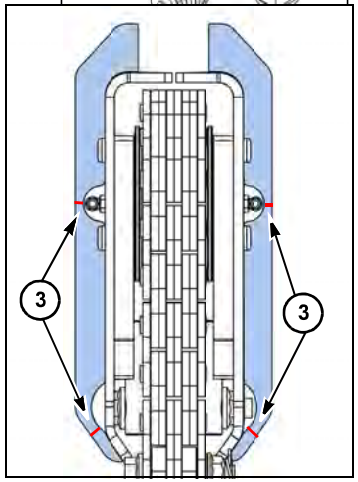
Hammer Lift Roller Nuts and Bolts – Check/Tighten

Tighten eight bolts **(2)**. Four bolts on each side.

Hammer Lift Roller - Wear and Tear

Ensure there are no areas less than 0.15 in (3.8 mm) in width. If material is too thin, replace with new guard. Two marked areas **(3)** are the concern (is a wear item and needs inspected to know if it needs replaced).

NOTE: If there is more than 0.25 in (6.3 mm) of wear on the hammer carriage side, replace carriage.



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Hammer Chain Nut

If hardware comes loose or needs to be reinstalled, add the red threadlocker.

Torque first nut to 50 ft-lb (67.8 Nm) while using a backup wrench to prevent chain anchor from rotating.

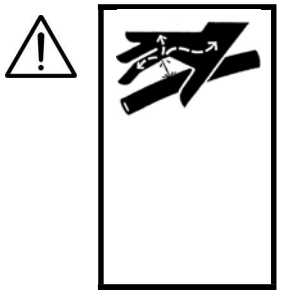
While holding chain anchor **(R)** straight, place a wrench on the first nut to prevent it from turning while torquing the second nut to 238 ft-lb (322 Nm).

NOTICE: Placing a wrench on the first nut and preventing it from turning while torquing the second nut is very important when using the double nut method mentioned above.



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Machine – Check



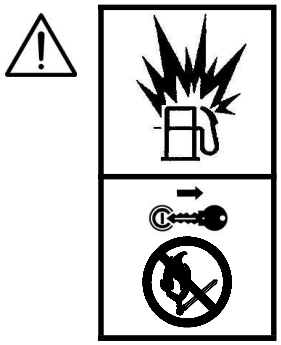
WARNING: Pressurized fluid can penetrate body tissue and result in death or serious injury. Leaks can be invisible. Keep away from a suspected leak. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

Check for:

- Cracks or abrasions in electrical harnesses
- Damage or corrosion on electrical connectors
- Hydraulic hoses for cracks or abrasions
- Loose or corroded hydraulic clamps

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Fuel Tank – Fill



WARNING: Fuel and fumes can explode and burn.

Shut off engine before refueling. No flame. No smoking.

Fill fuel tank at the end of each day to reduce condensation. Do not fill to the top; leave room for expansion.

(1) Fill cap

(2) Fuel gauge (on display)

(3) Fuel low indicator light

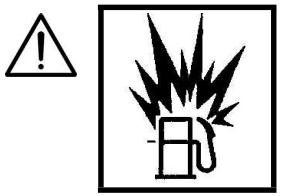


Diesel Fuel – Sulfur Content

Tier 4 engines require Ultra Low Sulfur Diesel (ULSD) fuel, with sulfur content less than 15 ppm (15 mg/kg). Use of fuels other than what is specified in the engine manual will impact engine performance, damage engine emissions systems, and may result in engine and exhaust system warranty being voided.

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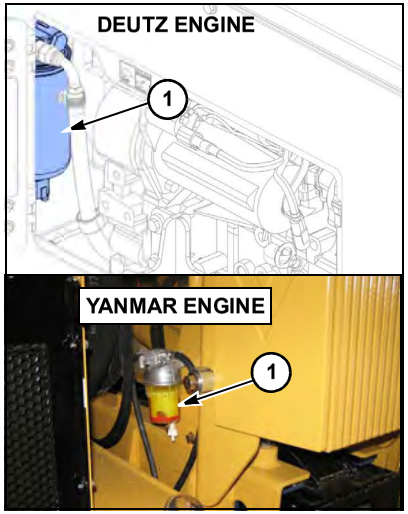
Fuel/Water Separator – Check/Drain



WARNING: Fuel and fumes can explode and burn.

Keep heat, flames, and sparks away from fuel. Always clean up spilled fuel. Do not smoke.

Check fuel/water separator for water or debris. Drain water from bottom as needed.

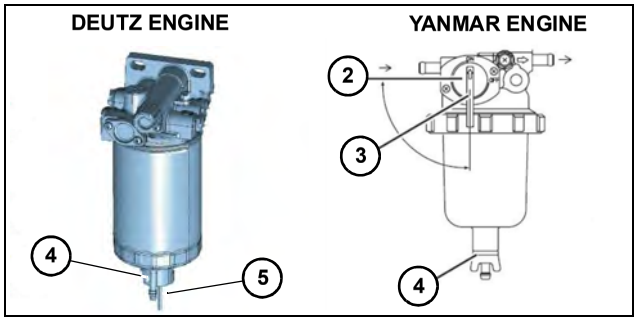


Deutz Engine

Step 1: Place suitable container(s) under separator **(1)**.
Step 2: Disconnect electrical cable **(5)**.
Step 3: Loosen drain plug **(4)**. Drain fluid until pure diesel fuel runs out.
Step 4: Tighten drain plug to 1.2 ft-lb (1.6 Nm)
Step 5: Connect electrical cable.
Step 6: Check for fuel leaks.

Yanmar Engine

Step 1: Place suitable container(s) under separator **(1)**.
Step 2: Close fuel cock **(2)**.
Step 3: Open drain cock **(4)**. Drain water.
Step 4: Close drain cock.
Step 5: Open fuel cock **(3)**.
Step 6: Turn *keyswitch* to on for 10 – 15 seconds to prime the fuel system.
Step 7: Check for fuel leaks.



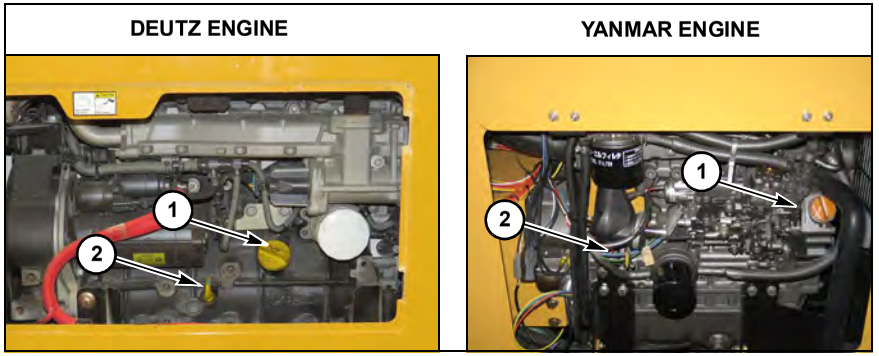
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Engine Oil Level – Check

With engine level, fill to full mark on dipstick. Do not overfill. Refer to “Lubricants,” *page 70-1.*

(1) Engine oil fill cap

(2) Dipstick



Hydraulic Oil Level – Check

NOTICE: Clean hydraulic fluid is important. Do not spill dirt or other contaminants into the tank. Filter all hydraulic fluid through a 5-micron filter before adding it to the tank. Check hydraulic fluid level. Refer to “Lubricants,” *page 70-1.*

Machine must be level and in transport position.

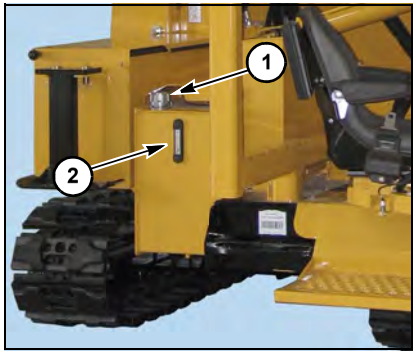
Step 1: Retract all cylinders.

Step 2: Check fluid level.

Step 3: If fluid is required, remove fill cap **(1)**.

Step 4: Fill to within the upper half of the sight gauge **(2)**.

Step 5: Install fill cap.

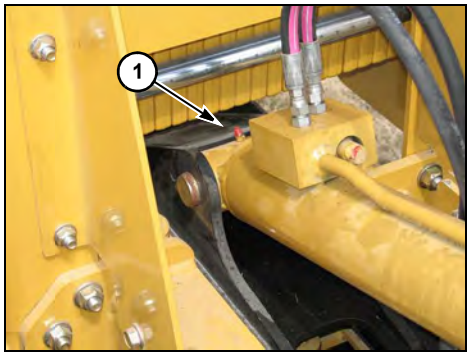


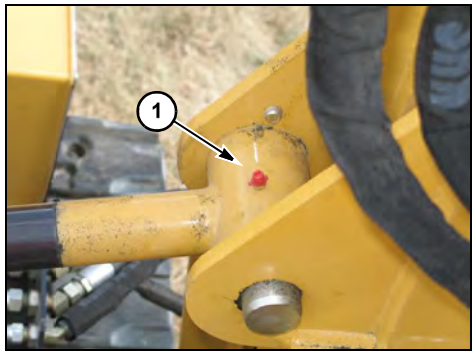
NOTICE: If fluid smells burned, contains air bubbles, or appears contaminated, contact Vermeer dealer immediately.

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Mast Tilt Cylinder – Grease

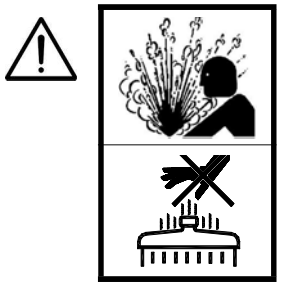
Three shots . . . . . one fitting each end





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Coolant Level - Check



WARNING: Hot fluid under pressure can erupt and scald if opened.

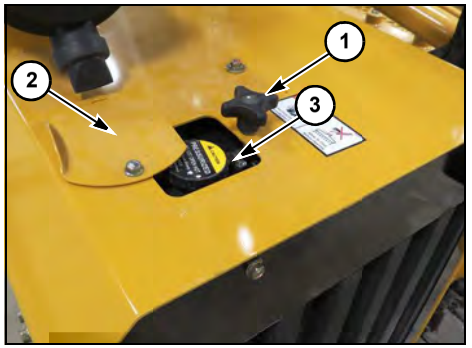
Allow to cool before opening radiator cap.

Unscrew knob **(1)** to slide plate **(2)** to the side.

Do not remove radiator cap from a hot engine. Wait until the temperature has decreased before removing the cap. Failure to do so can result in personal injury from heated coolant spray, or steam. Remove radiator cap slowly to relieve coolant system pressure.

Make a 50/50 mixture of coolant and distilled or deionized water. Lift hood and fill radiator to within 0.5 in (13 mm) of the bottom of fill pipe **(3)**.

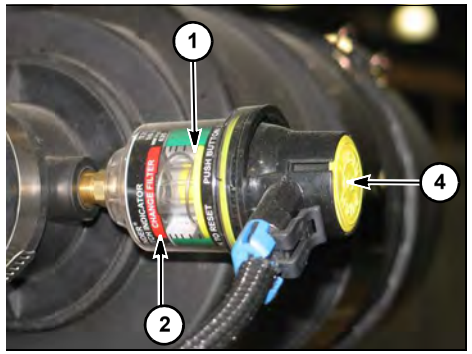
NOTICE: This machine was factory-filled with a 50/50 mixture of Shell Rotella ELC NF (Extended Life Nitrite Free) coolant. Compatible coolants include Chevron Delo ELC NF and Exxon Mobil Delvac ELC NF. Never add pure antifreeze to the system; always dilute to a 50/50 mixture.



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Air Cleaner Restriction Indicator – Check

Check the air cleaner restriction indicator daily. Replace the primary filter element if the yellow indicator **(1)** reaches the red line **(2)** or if alert light **(3)** comes on. Push button **(4)** to reset the indicator.



NOTICE: Do not remove air filter element(s) until the restriction indicator or the alert light shows replacement is needed, or if it is time for scheduled maintenance. The service interval for the primary element is every 500 hours and every 1,000 hours for the secondary element

NOTICE: Do not wash or blow out air cleaner elements. Elements must be replaced.

- Refer to “Primary Air Cleaner Element – Replace,” *page 60-42.*
- Refer to “Air Cleaner Elements – Replace,” *page 60-51.*



The air restriction indicator will not function correctly if:

- The air filter elements are damaged or not installed correctly.
- The air cleaner housing is damaged.
- The air duct between the air cleaner and the engine is damaged or clamps are loose.
- The air duct between the air cleaner and the air restriction indicator is damaged or pinched.

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Every 50 Hours or Weekly

Refer to the Engine Operation Manual supplied with machine for complete information.

- Check/Clean radiator fins.
- Perform initial check/adjustment of cooling fan V-belt tension after the first 50 hours, and every 250 hours thereafter.
- Check battery.

Wear Pads – Check

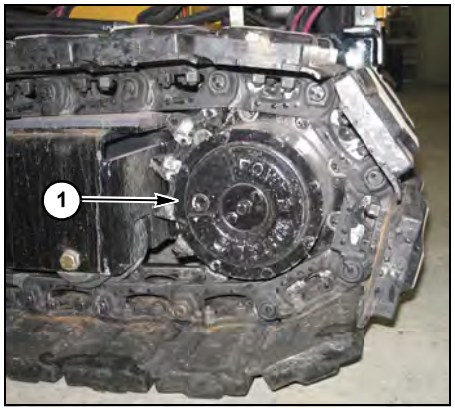
Refer to “Wear Pads – Adjust,” *page 60-61.*

Track Planetary Gearbox Oil Level – Check

Check oil level with plug at 3:00 or 9:00 position. Fill to check plug level.

(1) Fill/Check/Drain plug

Refer to “Lubricants,” *page 70-1.*



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Every 125 Hours

Safety Signs Maintenance

Safety signs located on your machine contain important and useful information that help you operate your equipment safely. Refer to the parts manual for locations.

To assure that all safety signs remain in place and in good condition:

- Keep safety signs clean. Use soap and water – not mineral spirits, abrasive cleaners, or other similar cleaners that will damage the sign.
- Replace damaged or missing safety signs. When attaching safety signs, the temperature of the mounting surface must be at least 40°F (5°C). The mounting surface must be clean and dry.
- When replacing a machine component with a safety sign attached, replace the safety sign also.

Replacement safety signs can be purchased from your Vermeer equipment dealer.

Backup Alarm - Check

The backup alarm must operate correctly to alert workers in the area when the machine is moving in reverse.

Check that the backup alarm sounds when:

- The operator is seated.
- The operator's station is in transport mode.
- The machine is propelled in reverse.

The backup alarm does not sound when using the remote control.

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Overall Machine – Check

Shields and guards – Check that all shields and guards are installed and are fastened securely to machine. Replace and repair shields or guards that are damaged or have missing parts.

Hardware – Check machine for loose, worn, or missing parts and hardware. Tighten loose parts and replace worn or missing parts. Refer to the parts manual for replacement parts.

Frame – Check machine frame and contact Vermeer dealer immediately if you notice bending or cracking.

ROPS – Check ROPS and contact dealer immediately if you notice any bends, cracks, breaks, or signs of flexing.

Operator's platform – The operator's platform acts as a barrier to help keep the operator away from the tracks. If platform is damaged, repair or replace.

Fire prevention – Keep engine compartment, battery, hydraulic lines, fuel tank, and operator's station clean of accumulated trash, grease, and debris.

Slip resistant material – Check for worn or missing slip-resistant strips. Replace at once if damaged. Refer to the parts manual for replacement parts.

Electrical harness – Check that electrical harness and all wires are correctly supported and not rubbing on sharp corners. Support loose wires hanging under machine frame.

Horn – Press horn button to sound horn. Repair or replace if horn does not sound.

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Joysticks, Dial, Switches – Check

- Check joysticks, joystick switches/buttons, and dial for freedom of movement. Refer to *page 20-12.*
- Check that joysticks spring-return to neutral.
- Check dial for noticeable detent in center position. Refer to *page 20-17.*

Neutral Start Interlock – Check

Neutral start interlock system must operate correctly for safety.

Step 1: Clear area around machine.

Step 2: With engine off, move controls out of neutral.

Step 3: Follow *Starting Procedure,* page *22-1.* The functions that are out of neutral must not move until all of them are returned to neutral, and then back out of neutral.

Contact your Vermeer dealer function movement is detected before all controls are returned to neutral.

Indicator Lights – Check

Check indicator light operation. Turn *keyswitch* to on for bulb test. All indicator cluster lights should light for five seconds. If any bulbs do not light, contact your Vermeer dealer.

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Park Brake – Check

This procedure should be done while machine is in transport mode.

WARNING: Machine could move if park brakes are not functioning properly. Death or serious injury can result if a bystander is struck or run over. Clear area of all personnel before checking park brake holding capacity.

Step 1: Follow *Starting Procedure,* page *22-1.*

Step 2: Bring engine to 1,500 rpm.

Step 3: Press *menu key* **(1)** on display and select “CALIBRATION” from the menu list. Refer to *page 20-27.*

Step 4: Select “PARK BRAKE TEST” from calibration menu. Refer to *page 20-28.*

Step 5: Engage ground drive after selecting brake test. Machine should not move during test. Contact local Vermeer dealer if machine moves during test.

“DISENGAGE GROUND DRIVE THEN RETRY” will be shown on display if ground drive is active before selecting test.



Step 6: Return ground drive controls to neutral and press *menu key* **(1)** to exit test.

PARK BRAKE TEST	
ENGAGE GROUND DRIVE MACHINE SHOULD NOT MOVE PRESS MENU TO EXIT	DISENGAGE GROUND DRIVE THEN RETRY

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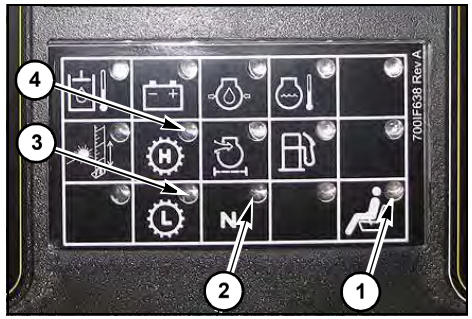
Operator Presence System – Check

The machine is equipped with an operator presence system. This system is intended for operator safety and must be maintained in good functional condition.

Follow *Starting Procedure,* page *22-1.* After starting the machine, check that operator presence system operates correctly.

- Operator presence indicator **(1)** must light whenever operator is in seat.
- Neutral indicator **(2)** must light when all controls are in neutral. If any control is not in neutral, the light goes off.
  - Machine must not move when ground drive is in neutral.
  - Hammer and mast must not move when controls are in neutral.

Contact Vermeer dealer if system does not work correctly.



Ground Drive Range Indicator Lights – Check

Check that green light **(3)** or **(4)** is on when the transmission is in low or high range, respectively.

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Operator's Station – Test

Before performing this test, clear area around machine.

Step 1: Sit in seat with operator's station in transport mode position. Operator's station controls for hammer, float, auto plumb, auto home, or auto target (if equipped) must not function.

Step 2: Sit in seat with station in work mode position. All controls should function.

Step 3: Rise out of seat. Operator presence indicator light will go out. No operator's station controls should function.



Transport Mode Position



Work Mode Position

Remote Control – Test

Before performing this test, clear area around machine.

Enable remote control. Refer to "Enable/Disable Remote Control," *page 21-6.* The beacon must turn on and horn must sound three times.

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Seat Belt Maintenance

Cleaning

Sponge webbing clean with mild soap and water. **Do not** use bleach, dye, or household detergents.

Maintenance

Seat belt webbing should not be allowed to run against sharp surfaces. Seat belts exposed to extreme conditions or climates must be inspected frequently and thoroughly. Seat belts that have been cut, frayed, malfunction in any way or were installed on a vehicle subsequently involved in an accident must be replaced. Always replace the entire seat belt system including belt, buckle, retractor, and mounting hardware.



WARNING: Failure to properly inspect and maintain the seat belt may result in death or serious injury. It is critical that any time a machine is involved in an accident, the entire seat belt system must be replaced. A seat belt should be considered to have a finite life and must be replaced as needed throughout the life of the machine. Seat belt must be inspected for needed maintenance every 100 hours or more often if exposed to severe environmental or vocational conditions.

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Inspection

Step 1: Check webbing. Pull the webbing out of the belt retractor and inspect the full length of the webbing for cuts, wear, fraying, dirt, and stiffness. If a belt shows cuts, fraying, extreme or unusual wear, the system should be replaced.

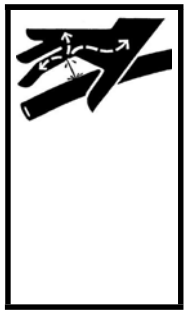
Step 2: Check buckle and latch for correct operation and to determine if latch plate is excessively worn, deformed, or if buckle is damaged or casing is broken.

Step 3: Check retractor web storage device operation by extending webbing to determine it locks properly and that it spools out and retracts webbing properly.

Step 4: Check web in areas exposed to ultraviolet rays from the sun or to extreme dust or dirt. If the original color of the web in these areas is extremely faded and/or the web is packed with dirt, the physical strength of this web may have deteriorated. If this condition exists, replace the system.

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Hydraulic System – Check



WARNING: Pressurized fluid can penetrate body tissue and result in death or serious injury. Leaks can be invisible. Keep away from a suspected leak. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

Hydraulic System Pressure – Relieve

Relieve all pressure in the hydraulic system before disconnecting hoses or performing other work on the system.

When loosening fittings in hoses where residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Ensure all connections are tight and hoses are in good condition before applying pressure to the system.

Hydraulic Systems – Check

Check machine and all attachments. Refer to the parts manual for replacement parts.

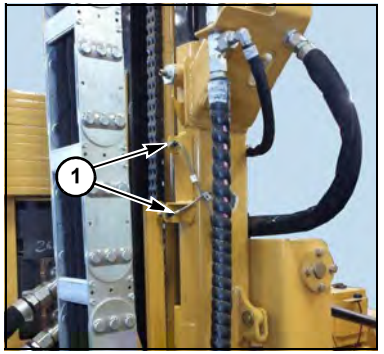
- Ensure all connections are tight and hoses are in good condition before applying hydraulic pressure to the system.
- Check for leaking hoses, kinked hoses, and for hoses that rub against each other, or other parts of the machine. Replace all deteriorated or damaged hoses. When a hose with a protective sleeve is replaced, always install a new protective sleeve over the new hose.
- Check hydraulic cylinders for leaks and damage. Repair or replace as required.

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Hammer Proximity Switches – Check

S/N 1001 – 2263

Warm hydraulic oil, then check proximity switches **(1)** for function.



With the hammer in the “sensing area” between two switches:

- Tilt mast to the rear of machine and check the gap.
- Tilt mast to the front and check gap.

Correct switch clearance is 0.25 – 0.5 in (6 – 13 mm) for the entire hammer position range.

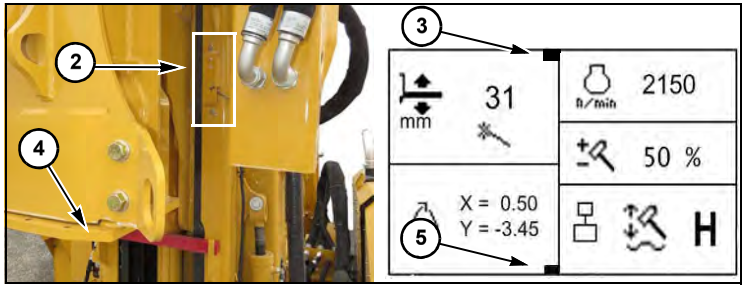
Adjust hammer adjusters correctly before adjusting switch gap. Refer to *page 60-62.*

To adjust:

Loosen nuts on back sides of switches.

S/N 2264 –

While in the main screen, raise hammer. Hammer position indicator **(3)** must illuminate when bottom of hammer carriage **(4)** is above sensor **(2)**. Ensure position indicator illuminates on machine display and remote-control display.



While in the main screen, lower hammer. Hammer position indicator **(5)** must illuminate when bottom of hammer carriage **(4)** is below sensor **(2)**. Ensure position indicator illuminates on machine display and remote-control display.

If test fails, contact your Vermeer dealer.

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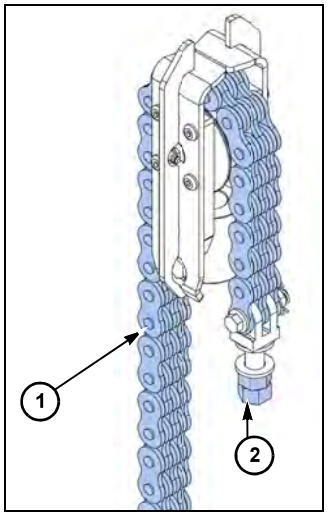
Percussion Hammer Lifting Chain, Anchor, and Pins – Check/Clean/Lubricate

Inspect lifting chain, anchor, and pins. Refer to “Chain – Inspect,” *page 60-47.*

Clean chain **(1)** with an appropriate cleaner like a paraffin-derived product.

Lubricate with dry spray lubricant.

The nuts **(2)** holding the anchor bolt needs to be checked for tightness every 125 hours. Refer to “Hammer Chain Nut,” *page 60-14.*



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Ground Drive System – Inspect

Check condition of wear plates. Replace wear plates if missing or if thickness is less than 0.06 in (1.6 mm).

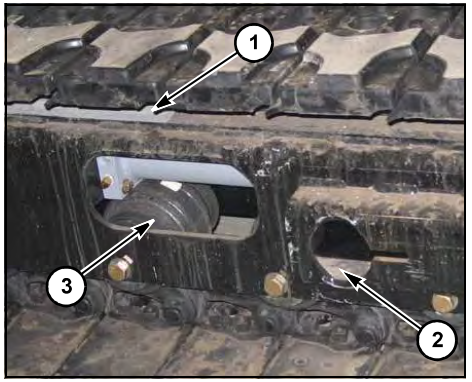
(1) Upper track wear plate
One per each track.

(2) Lower track wear plates
One per each track.

In extremely dusty conditions, check daily.

Replace wear plates before heads of mounting screws are damaged. Refer to the service manual for procedures.

(3) Lower track rollers
Seven on each side. Ensure all rollers roll when track weight is on them and machine is moving. Replace a roller if it does not turn.



Track Pads and Bolt Torque – Check

Check for loose or damaged track pads. Replace damaged pads. Tighten loose bolts.

Track Chain Tension – Check

Refer to “Track Tension – Adjust,” *page 60-63.*

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Every 250 Hours

Refer to the Engine Operation Manual supplied with machine for complete information.

- Check/Adjust cooling fan V-belt tension.
- Check/Adjust governor lever and engine speed control **(Yanmar engines only)**.

Engine Oil and Filter - Change

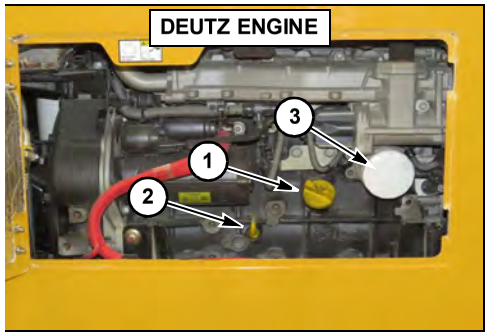
Replace engine oil and filter after the first 50 hours of operation, and every 250 hours thereafter. Refer to “Lubricants,” *page 70-1.*

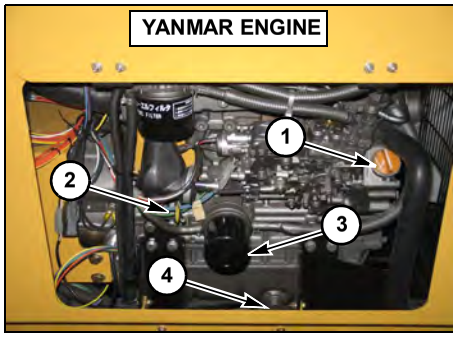
(1) Oil Fill

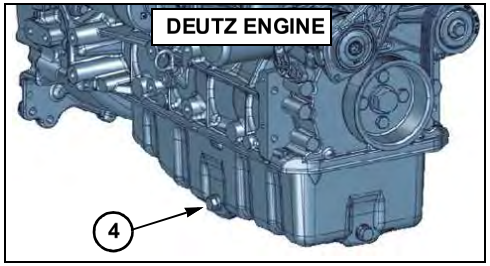
(2) Dipstick

(3) Oil Filter

(4) Drain Plug







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Change oil and replace filter while engine is still warm. Engine must be level.

Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Remove oil fill **(1)** cap.

Step 3: Remove drain plug **(4)** and drain oil into suitable container.

Step 4: Install drain plug.

Step 5: Remove oil filter **(3)** with oil filter wrench (counterclockwise). Clean gasket surface of filter head.

Step 6: Coat gasket of new filter with engine oil.

Step 7: Install new filter by hand (clockwise) until filter gasket contacts filter head surface.

Step 8: Tighten new filter an additional three quarters of a turn using filter wrench.

Step 9: Add new engine oil to engine. Refer to “Lubricants,” *page 70-1.*

Step 10: Follow *Starting Procedure,* page *22-1.* Check for oil leaks.

Step 11: After engine is warm, shut it off. Follow *Shutdown Procedure,* page *23-1.*

Check engine oil level using dipstick **(2)**. Oil level must be between MIN and MAX marks on dipstick. Add oil as necessary.

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Radiator and Hydraulic Oil Cooler – Clean



WARNING: Eye injury possible. Wear a face shield when using compressed air to clean or dry solvent-coated parts.

Clean fins with water or compressed air. Partially blocked fins will increase hydraulic oil and engine operating temperature. Be careful not to damage cooler fins, which will decrease cooling performance.

NOTICE: Verify water nozzle is at least 12 in (30.5 cm) from the cooler and air nozzle is at least 8 in (20.3 cm) from the cooler. Direct the water or air straight through the cooler to avoid bending the cooler fins.

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Hydraulic Filters – Replace (Initial)

Capacities and specifications are listed in “Lubricants.” Refer to *page 70-1.*

Replace hydraulic fluid filter:

- After initial 250 service hours, then every 500 service hours
- Each time hydraulic fluid is changed

(1) Charge filter

(2) Return filter

Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Thoroughly clean area around filter to keep contaminants out of hydraulic system.

Step 3: Place a suitable container under machine to collect oil.

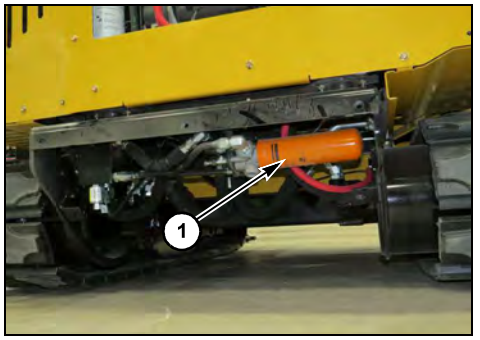
Step 4: Use a filter wrench to turn filter body counterclockwise to remove filter.

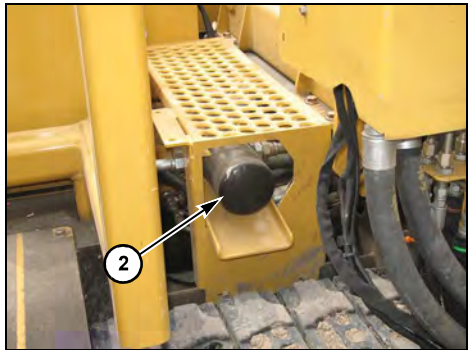
Step 5: Carefully clean mating surface of filter head with a lint-free cloth. Look for cracks or pitting in filter head. If needed, replace filter head.

Step 6: Apply a thin film of oil to gasket of new filter.

Step 7: Install filter onto filter head. Tighten clockwise by hand until filter gasket contacts filter head.

Step 8: Turn three quarters to one additional turn.





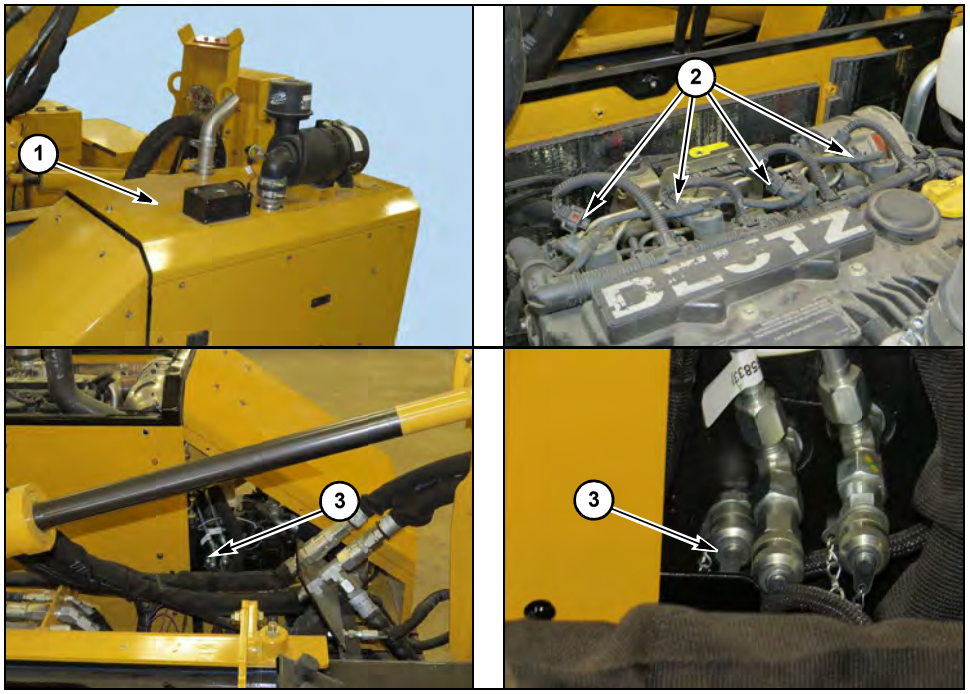
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Hydraulic System – Restore

Step 1: Remove top shield **(1)**. Disconnect four fuel injectors **(2)** to prevent engine from starting.

Step 2: Install a low-pressure gauge with a range of 0 – 600 psi (0 – 4.1 MPa) on port **(3)**. Crank engine until a minimum charge pressure of 200 psi (1.4 MPa) is reached.

NOTICE: Never operate starter motor for more than 15 seconds at a time. Cycle key off and on to reset. Allow starter motor to cool 30 seconds between attempts. Turn key to off position before restarting.



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Step 3: After charge pressure has been reached, connect fuel injectors.

Step 4: Follow *Starting Procedure,* page *22-1.* Operate engine at low idle for four minutes while checking for leaks.

NOTICE: Do not operate hammer, mast, or *ground drive controls*, or raise engine speed above low idle for at least four minutes.

Step 5: Follow *Shutdown Procedure,* page *23-1.*

Step 6: Check hydraulic fluid level. The fluid level must be within the upper half of the sight gauge with all cylinders retracted.

Step 7: Start engine.

Step 8: Cycle all hydraulic cylinders and hammer functions to fill all components.

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Every 500 Hours

Hydraulic Filters – Replace

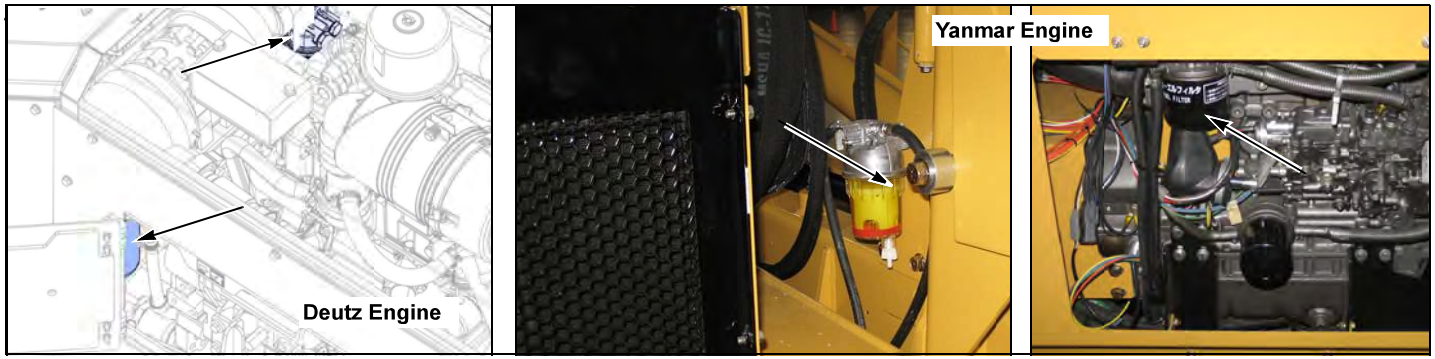
Refer to “Hydraulic Filters – Replace (Initial),” *page 60-38.*

Fuel Filters – Replace

WARNING: Fuel and fumes can explode and burn.

Keep heat, flames, and sparks away from fuel. Always clean up spilled fuel. Do not smoke.

Refer to the Engine Operation Manual for procedures.



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Primary Air Cleaner Element – Replace

Replace the Primary element every 500 service hours and the secondary element every 1,000 service hours. Refer to *page 60-51.*

NOTICE: Harsh, dirty, or dusty environments may require more frequent changes. Refer to “Air Cleaner Restriction Indicator – Check,” *page 60-21.*

NOTICE: Do not clean and return a used element back into service. Air cleaner element must be replaced.

Step 1: Release latches **(1)** and remove cover **(2)**.

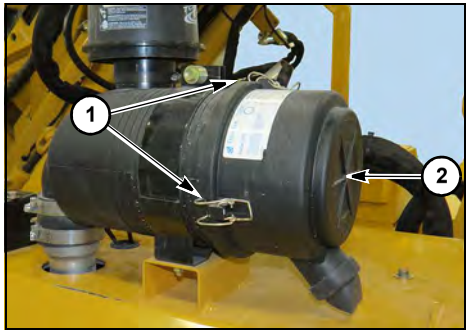
Step 2: Remove the primary filter element and discard.

Step 3: Wipe inside of housing with a clean cloth.

Step 4: Install new primary filter element.

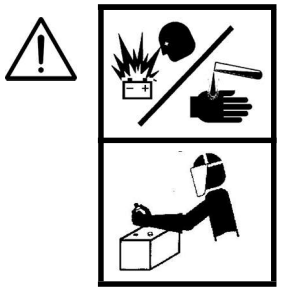
Element must be properly installed and seated.

Step 5: Install cover and secure latches.



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Battery Maintenance



WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Battery explosion can blind. Acid can blind and burn. Tools and cable clamps can make sparks.

Do not smoke. Shield eyes and face. Read instructions.

- Use a flashlight to check electrolyte level, if equipped.
- Work in a well-ventilated area.
- Prevent breathing fumes from battery.
- Prevent contact with skin, eyes, or clothing.
- Keep flames and sparks away, and do not smoke.
- Keep out of reach of children.
- Do not short across battery terminals or allow tools to short from battery terminals to frame.
- Do not jump-start or charge a battery with frozen electrolyte.

In case of acid contact:

External: Flush with plenty of water. If eyes have been exposed, flush with water for 15 minutes and get prompt medical aid.

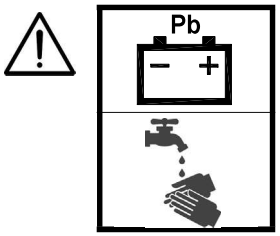
Internal: Drink large quantities of water or milk, then milk of magnesia, beaten egg, or vegetable oil. Call a physician immediately.

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Battery Cables and Connections – Check

Check battery cables for wear. Verify all battery connections are clean, tight, and corrosion-free.

Battery Terminals – Clean



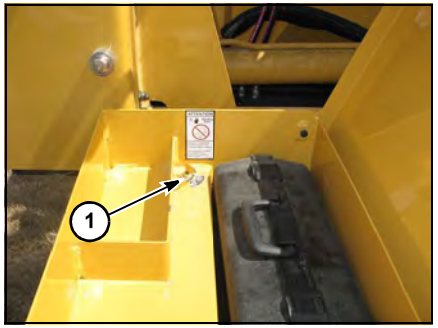
WARNING: Battery post, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.

Wash hands after handling.

Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Disconnect battery ground with the *battery disconnect switch* **(1)**.

Step 3: Open battery compartment.



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Step 4: Remove negative (-) cable **(2)**, then positive (+) cable **(3)**.

Step 5: Clean terminals and clamps with a stiff wire brush.

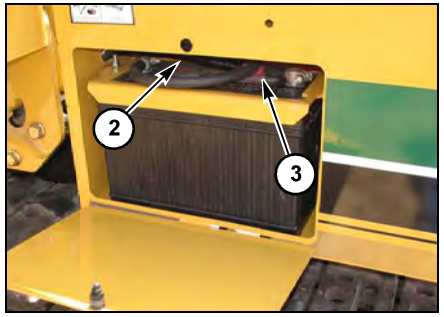
Step 6: Apply a light coating of petroleum jelly around base of each terminal.

NOTICE: Keep top of battery clean. If necessary, wash it with a baking soda solution, then rinse with clean water. Do not let baking soda solution enter battery.

Step 7: Install positive cable, then negative cable. Install plastic cap over positive cable clamp.

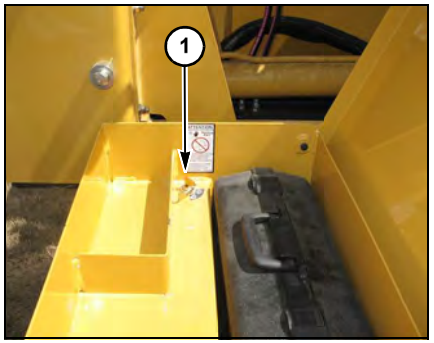
Step 8: Close battery compartment.

Step 9: Reconnect battery ground with *battery disconnect switch*.



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Battery Electrolyte Levels – Check (If Equipped)



Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Disconnect battery ground using battery disconnect switch **(1)**.

Step 3: Open battery compartment.

Step 4: Remove battery.

Step 5: Remove cell caps.

Step 6: Fill each cell with distilled water fluid level is low.

NOTICE: If battery is underfilled, the electrolyte will be too concentrated, causing plates to deteriorate more rapidly and plate tops to harden and become chemically inactive. Add distilled water, but do not overfill. In freezing weather, run engine for a few minutes immediately after filling battery to allow proper mixing of water and electrolyte. If battery uses too much water, check alternator voltage regulator for overcharging.

Step 7: Install cell caps.

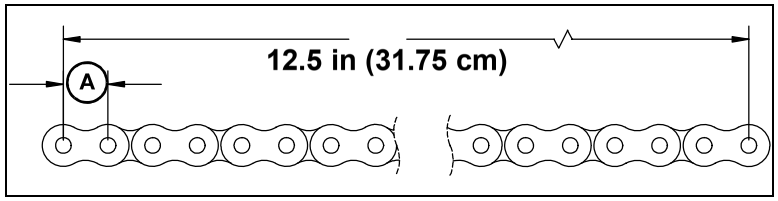
Step 8: Install battery. Refer to “Battery – Replace,” *page 60-58.*

Step 9: Close battery compartment.

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Chain – Inspect

Check chain assemblies for split leaves, loose pins, excessive wear, or elongation.



To measure chain wear:

Step 1: Fully lower hammer, then raise enough to put full weight of hammer onto chain.

Step 2: Measure 11 pins of chain center to center **(A)**.
The correct measurement for 11 pins of new chain is 12.5 in (31.75 cm).

Replace chain if 11 pins measure more than 12.75 in (32.4 cm).

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Blunt Tool/Strike Block – Remove and Inspect

Blunt Tool/Strike Block – Remove

Step 1: Remove four bolts and nuts to remove cover plate **(1)** from hammer housing **(2)**.

Step 2: Rotate extractor plate **(3)** and secure with pin.

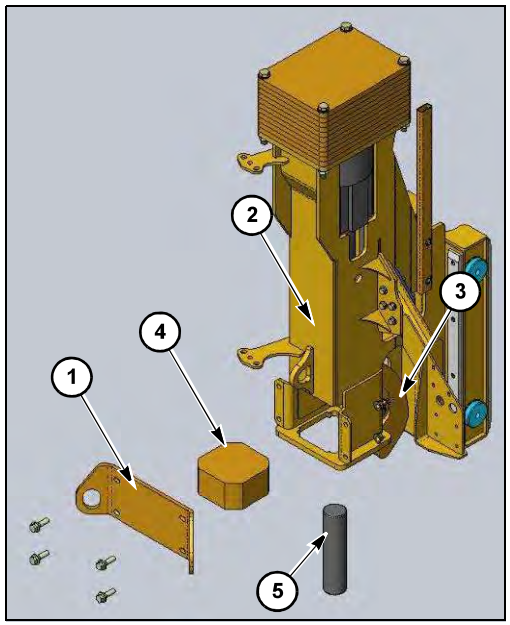
WARNING: In Step 3, when sliding striker block **(4)** out of opening in hammer housing, maintain a firm grip on block as it weighs in excess of 50 lb (23 kg). Also, slide block out very slowly and keep one hand on it. At the same time, reach inside from below with other hand to grasp end of blunt tool **(5)**. This prevents the tool, which weighs in excess of 20 lb (9 kg), from falling freely out of hammer assembly, potentially causing injury. Get an assistant to help.

Step 3: Slowly slide striker block **(4)** out from hammer housing just enough to allow blunt tool **(5)** to come out of bushing. Be prepared to prevent blunt tool from falling out of hammer once striker blocker has cleared end of tool.

Step 4: Remove blunt tool.

Step 5: Inspect blunt tool for burrs and excessive wear.

- Carefully grind off burrs.
- Replace tool if excessively worn. Contact your Vermeer dealer.



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Bushing – Inspect

If bushing ID is the same as retainer ring ID, bushing must be replaced.

Bushing – Remove

Remove retainer ring. Bushing may drop out.

If bushing does not slide out easily, contact your Vermeer dealer.

Blunt Tool/Striker Block – Install

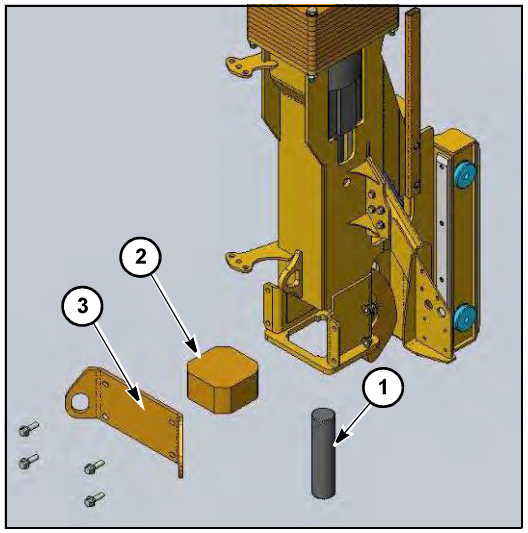
Step 1: Install bushing.

Step 2: Install retainer ring.

Step 3: Install blunt tool **(1)** into bushing.

Step 4: Install striker block **(2)**.

Step 5: Install cover plate **(3)** and secure with four bolts and nuts.



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Every 750 Hours

Hammer Disassemble/Inspect

Hammer assembly should be removed and disassembled for inspection every 750 hammer hours.

Contact your Vermeer dealer for assistance.

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Every 1000 Hours

Refer to the Engine Operation Manual supplied with machine for complete information.

- Engine valve clearance – adjust (Yanmar engines only).

Air Cleaner Elements – Replace

NOTICE: Harsh, dirty, or dusty environments may require more frequent changes. Refer to “Air Cleaner Restriction Indicator – Check,” *page 60-21.*

NOTICE: Do not clean and return a used element back into service. Air cleaner elements must be replaced.

Step 1: Release latches **(1)** and remove cover **(2)**.

Step 2: Remove the primary filter element and discard.

Step 3: Wipe inside of housing with a clean cloth.

Step 4: Remove the secondary filter element and discard.

NOTICE: Do not allow any debris to enter the intake port.

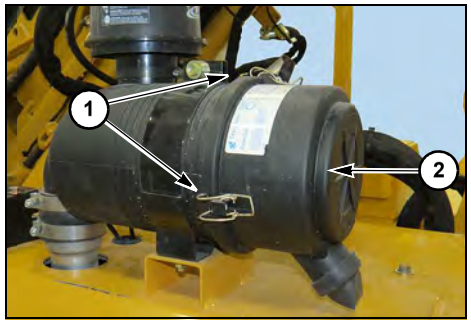
Step 5: Install new secondary element.

Element must be properly installed and seated.

Step 6: Install new primary element.

Element must be properly installed and seated.

Step 7: Install cover and secure latches.



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Hydraulic Fluid – Change

Capacities and specifications are listed in “Lubricants.” Refer to *page 70-1.*

NOTICE: If fluid smells burnt, contains air bubbles, or appears contaminated, consult your Vermeer dealer immediately.

Step 1: Operate engine until hydraulic fluid is warm.

Step 2: Follow *Shutdown Procedure,* page *23-1.*

Step 3: Remove fill cap **(1)** and O-ring and strainer under cap.

Step 4: Remove two drain plugs from bottom of hydraulic tank and drain fluid into a suitable container, 36-gal (140-L) capacity minimum.

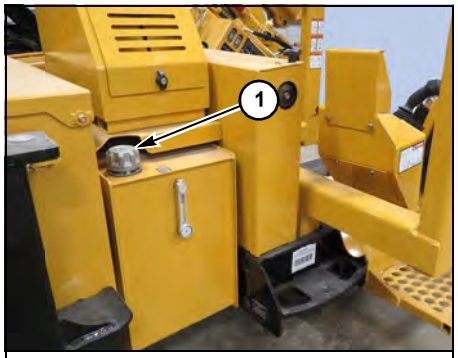
Step 5: Remove strainer **(2)** from inside of tank.

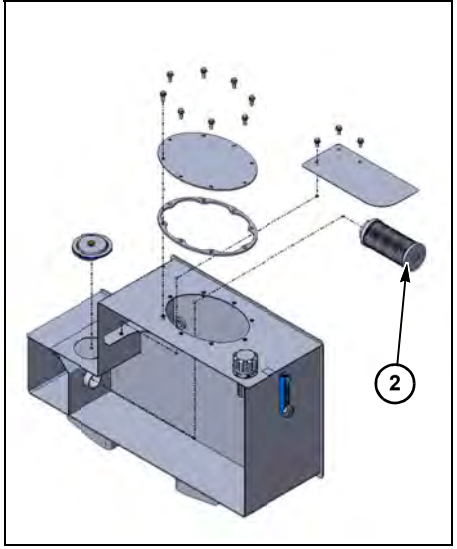
Step 6: Clean and inspect drain plugs.

NOTICE: Contact your Vermeer dealer if excessive metal particles are found on the magnetic drain plugs.

Step 7: Install drain plugs.

Step 8: Replace hydraulic filters. Refer to “Hydraulic Filters – Replace (Initial),” *page 60-38.*





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Strainer – Clean and Inspect

Clean strainer with a petroleum-based paint thinner or other good cleaning solvent. Scrub strainer with a soft-bristled brush.

Inspect strainer. Consult a Vermeer dealer if you find:

- Lacquers that may have formed as a result of hot spots in the hydraulic system
- An extremely dirty strainer that will not come clean
- Metallic particles on the screen mesh
- Evidence of a hydraulic system failure
- Evidence of holes or other damage that would allow unfiltered fluid to circulate in the hydraulic system

Strainer – Install

Install strainer and fill cap.

Tank – Fill

NOTICE: Clean hydraulic fluid is very important for longer life and good operation of hydraulic components. Take care not to spill dirt or other contaminants into the tank when checking or adding hydraulic fluid. Filter all hydraulic fluid through a 5-micron filter before adding it to the tank.

Step 1: Fill hydraulic fluid tank. Refer to “Lubricants,” *page 70-1.*

Step 2: Install and tighten fill cap.

Hydraulic System – Restore

Refer to “Hydraulic System – Restore,” *page 60-39.*

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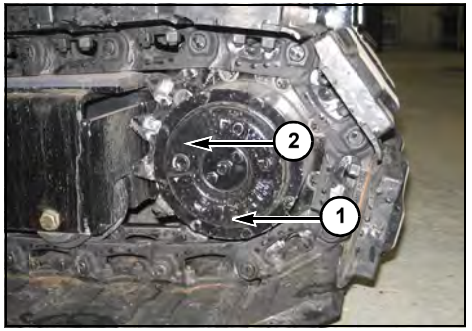
Track Planetary Oil – Change

Fill/Check/Drain plug

(1) Drain position: Rotate plug to bottom to drain.

(2) Fill/Check at 3:00 or 9:00 position: Fill to check plug level.

Refer to “Lubricants,” *page 70-1.*



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Every 1500 Hours

Refer to the Engine Operation Manual supplied with machine for complete information.

- Crankcase breather element - replace

Yanmar Engines Only:

- Inspect crankcase breather system.
- Inspect, clean, and test fuel injectors. Contact your Vermeer dealer for assistance.

Every 2000 Hours

Refer to the Engine Operation Manual supplied with machine for complete information.

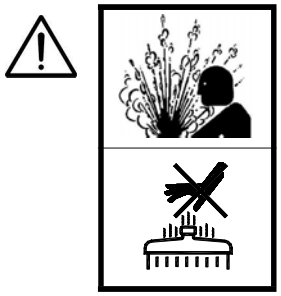
- SCR feed pump filter cartridge – replace
- Cooling system – drain and clean. Refer to *page 60-56.*

Yanmar Engines Only:

- Check and replace fuel hoses and engine coolant hoses.
- Lap the intake and exhaust valves. Contact your Vermeer dealer for assistance.

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Cooling System – Drain and Clean



WARNING: Hot fluid under pressure can scald.

Allow engine to cool before opening radiator cap.

Capacities and specifications are listed in “Lubricants.” Refer to *page 70-1.*

Drain, flush, and refill cooling system with new coolant every 2000 hours or every year. Refer to the Engine Operation Manual for complete procedure.

Use a 50/50 mixture of Extended Life (ELC) Nitrite-Free (NF) coolant and distilled or deionized water. Never add pure antifreeze to the system; always dilute to a 50/50 mixture. Never use Supplemental Cooling Additives (SCAs) with ELC coolant. Refer to the Engine Operation Manual for more information.

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Maintenance as Required

Engine Maintenance

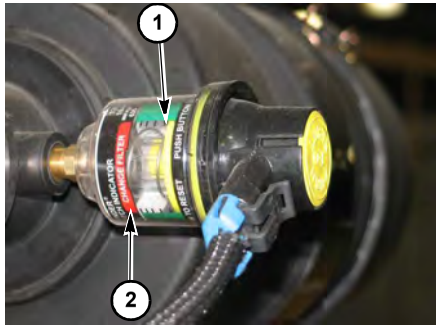
Refer to the Engine Operation Manual supplied with machine for complete information.

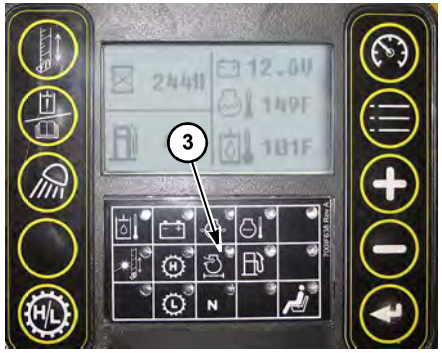
Air Cleaner – Replace Element(s) as Needed

Replace the primary filter element when yellow indicator **(1)** reaches the red band **(2)** or when alert light **(3)** comes on.

For additional information:

- Refer to “Air Cleaner Restriction Indicator – Check,” *page 60-21.*
- Refer to “Primary Air Cleaner Element – Replace,” *page 60-42.*
- Refer to “Air Cleaner Elements – Replace,” *page 60-51.*





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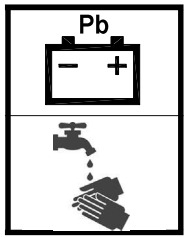
Battery – Replace

Replacement batteries must meet standard battery specifications provided in “Machine Specifications.” Refer to *page 70-2.*



WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Battery explosion can blind. Acid can blind and burn. Tools and cable clamps can make sparks.

Do not smoke. Shield eyes and face. Read instructions.



WARNING: Battery post, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.

Wash hands after handling.

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Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Turn *battery disconnect switch* **(1)** to disconnect.

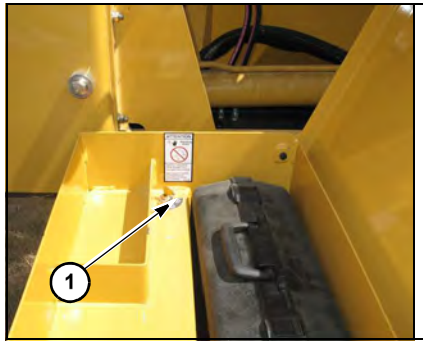
Step 3: Open battery compartment **(2)**.

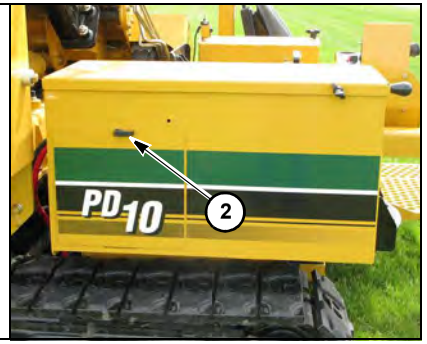
Step 4: Remove battery hold-down bracket **(3)**.

Step 5: Remove negative (-) cable **(4)** first. Then remove positive (+) cable **(5)**.

Step 6: Remove battery and install new battery.

Step 7: Apply a light coating of petroleum jelly around base of each terminal.

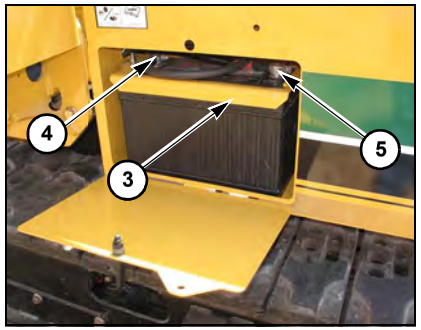




Step 8: Install battery hold-down bracket **(3)**.

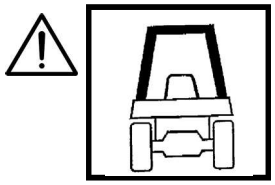
Step 9: Install positive (+) cable **(5)** and then negative (-) cable **(4)**. Check that red cap is correctly installed over positive cable clamp.

Step 10: Turn *battery disconnect switch* to connect.



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Rollover Protection Structure (ROPS) – Check



WARNING: The rollover protection structure (ROPS) is intended to protect the tractor operator in the event of a rollover. In order for you to be protected by the ROPS, you must wear seat belts. Follow instructions below relating to ROPS safety precautions.

- Do not remove ROPS.
- Do not modify ROPS in any manner. Unauthorized modifications, such as welding, drilling, cutting, or adding attachments, could weaken the structure and reduce your protection.
- If ROPS has been damaged or subjected to a rollover, replace it. Do not attempt any repairs.
- The roll bars have been certified to a maximum gross machine weight as stated on the ROPS label located on the ROPS. Under no circumstances may total gross machine weight exceed the weight specified on ROPS label.
- If ROPS must be replaced, be sure to use original parts ordered from Vermeer Corporation.

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Wear Pads – Adjust

The slide adjuster material is self-lubricating; the slides are intended to be run dry. Lubrication such as oil or grease may cause dirt to accumulate, which will increase wear. Dry lubricant such as graphite may be used.

To adjust, tighten adjuster bolts to remove clearance between pad and slide frame.

NOTICE: Do not overtighten beyond removing clearance. Overtightening accelerates wear and reduces performance.

Adjust when movement of the black slide rails is greater than 0.06 in (1.6 mm) when tilting the mast to its limits, or when auto plumb is having difficulty.

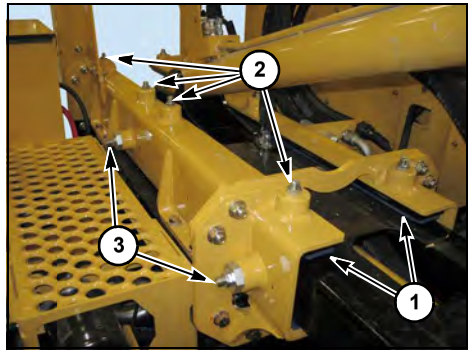
Replace wear pads **(1)** when their thickness is 0.25 in (6 mm) or less.

Base

Tighten bolts (2) (four on each side).

Check wear with mast moved fully rearward.

Adjust two bolts **(3)** when base slide moves side-to-side. Adjustment bolts (3) are only on side shown. Other side is welded.



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Mast

Tighten six bolts **(4)** (two on either side of hammer and two on side of mast base) to minimize mast movement as it is raised and lowered.

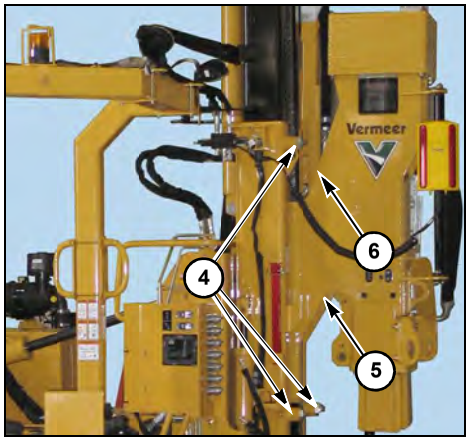
Hammer

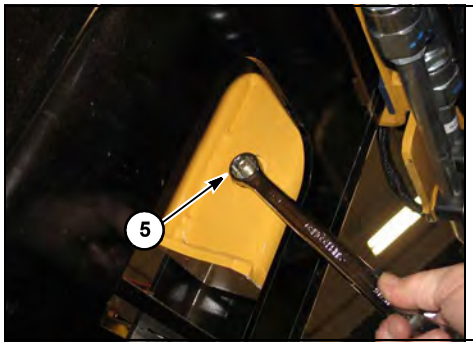
Two adjustment bolts are located inside the mast at top and bottom of hammer, one on each side.

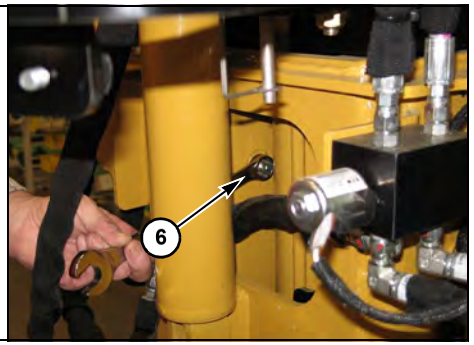
Raise mast fully and install hammer support bar before adjusting two bolts **(5)** on bottom of hammer (shown from bottom of mast).

Lower mast and tilt toward machine partway to adjust two bolts **(6)** on top of hammer.

If the hammer carriage adjusters are overtightened, the hammer will not float or will float too slowly. This decreases hammer performance.







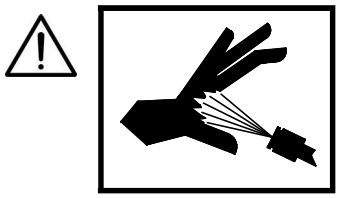
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Track Tension – Adjust

Track tension is set with a grease cylinder that compresses a spring against the idler roller.

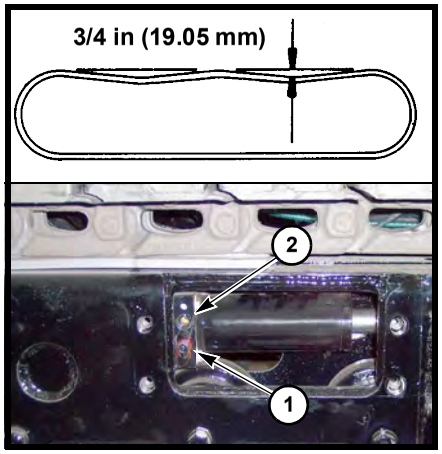
Remove cover plate (if equipped). With clean tracks, the correct tension is 0.75 in (19.05 mm) of slack when measured as shown.

To increase: Attach grease gun to the fitting on ball check **(1)**, one on each track. Add grease to grease cylinder until track is correctly tensioned.



WARNING: Tensioning system contains grease under pressure. Death or serious injury possible if struck by fitting or if grease is injected under skin. Follow adjustment procedure and wear suitable protective clothing and proper face shield.

To decrease: Slowly loosen Allen screw **(2)** about one-half turn. Track may need to be turned for screw to be loosened. Allow grease to come out until track tension is correct. Tighten screw and clean up expelled grease.



Hammer – Service

Contact your Vermeer dealer.

Mast – Removal

Refer to service manual or contact your Vermeer dealer.

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Fuses and Relays – Replace

Unscrew knobs **(A)** and remove shield **(B)**.

(1) Fuse panel

DP-10 supply 10 amp	C248 supply 25 amp
Tractor supply 10 amp	Remote receiver 10 amp
Telematics supply 5 amp	12 V outlet 15 amp
GPS supply 5 amp	Work lights 10 amp



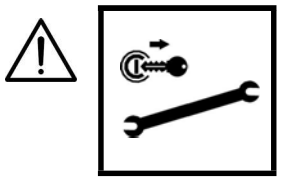
Remote Control Batteries – Replace

Replace remote control batteries as needed. Refer to “Remote Control Batteries,” *page 21-11.*

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Storage

Preparing for Storage



WARNING: Failure to use shutdown procedure can result in unexpected hazard(s). Death or serious injury could result due to entanglement, crushing, cutting, or other hazardous contact. Follow Shutdown Procedure after operating, before performing any service or maintenance, and before transporting. Refer to *Shutdown Procedure, page 23-1*.

- Store machine inside or under cover.
- Fully lower mast and hammer.
- Clean off foreign material and wash machine. Repaint bare metal to inhibit rust.

NOTICE: Machine controls and electrical/electronic devices are not rated to withstand high-pressure water and high temperature power washers. Water intrusion will likely cause malfunction or damage to any devices hit directly by the water spray. Keep pressure washer stream away from machine controls and electrical/electronic devices. Compressed air can also push moisture through some connector and component seals. Do not point air nozzle directly at seal areas.

- Coat exposed cylinder rods with grease.
- Clean and oil chain.
- Grease the machine.
- Repair leaks.
- Repair or replace worn or broken parts
- Replace damaged safety signs and decals.

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- Drain the fuel tank.
- Refer to the Engine Operation Manual for engine storage instructions.
- Disconnect battery cables. If necessary, remove battery. Refer to “Battery - Replace” and store where the temperature will not drop below freezing. Refer to *page 60-58.* Check fluid level and charge fully; recheck every 30 days and charge if necessary.

Removing from Storage

- Remove all protective coverings and grease.
- Fill fuel tank.
- Check engine oil and hydraulic fluid levels.
- Charge battery and install in machine if removed.
- Refer to the Engine Operation Manual for restoring engine to operation.

Cleaning the Machine

Machine controls and electrical/electronic devices are not rated to withstand high-pressure water and high temperature power washers. Water intrusion will likely cause malfunction or damage to any devices hit directly by the water spray. Keep pressure washer stream away from machine controls and electrical/electronic devices. Compressed air can also push moisture through some connector and component seals. Do not point air nozzle directly at seal areas.

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Section 65: Troubleshooting

Percussion Hammer

Symptom	Cause	Solution
Mast auto plumb inoperative	Operator's station not in work position	Pivot operator's station to work mode position.
	Advisory or fault	Contact your Vermeer dealer.
	Valve control not getting signal from joystick	Contact your Vermeer dealer.
	Mast tilt limit out of range	Manually move mast within tilt range. Lower hammer to increase range.
Mast auto plumb failed	Hammer carriage too high on mast	Lower hammer.
	Plumb tolerance too tight	Readjust plumb tolerance.
	Mast pivot or slides loose	Contact your Vermeer dealer.
Hammer does not work	Operator's station in transport mode position	Pivot operator's station to work mode position.
	Valve control not getting signal from joystick	Contact your Vermeer dealer.
	Tool is stuck in hammer	Contact your Vermeer dealer.
	Hammer not sitting on pile	Lower hammer to pile.
	Hammer control dial not working	Contact your Vermeer dealer.
Hammer runs slow	Hammer speed adjustment set low	Adjust hammer speed knob to a higher setting.
	Hammer valve section not working properly	Contact your Vermeer dealer.
	Tool is stuck in hammer	Contact your Vermeer dealer.
	PFC pump controls incorrect	Contact your Vermeer dealer.
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Symptom	Cause	Solution
Hammer will not lift	Float switch in float position	Move switch out of float position.
	Hammer carriage lift chain disconnected	Contact your Vermeer dealer.
	Damaged or worn hydraulic pump	Contact your Vermeer dealer.
Hammer will not float down or is too slow	Float switch not in float position	Move switch to float position.
	Cold hydraulic oil	Warm hydraulic system through operation.
	Improper viscosity oil used for ambient temperature	Warm hydraulic system or change to proper weight oil.
	Hammer carriage slides too tight	Adjust slides. Refer to *page 60-62.*
	Mast is bent	Contact your Vermeer dealer.
Piles will not install on grade using laser receiver	Laser receiver not installed or connected	Install or connect laser receiver.
	“Measure mode” not on	Press “Measure mode” key to turn on.
	Laser receiver not receiving laser signal	Check laser height, location, power, etc. is correct.
		Ensure laser is red.
		Obstruction between laser and receiver
		Ensure receiver is receiving correct laser if there is more than one laser on job site.
Top of pile is deformed beyond use	Pile is too thin for ground conditions	Use appropriate pile for ground conditions
		Adjust central valve on hammer. Contact your Vermeer dealer about this procedure.
	Striker block making uneven contact with pile	Use proper size of guide for size of pile being driven.

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Machine

Symptom	Cause	Solution
Will not move with operator's station in transport position	Operator's station proximity switch is faulty, disconnected or out of adjustment	Contact your Vermeer dealer.
	Ground drive joystick not working	Contact your Vermeer dealer.
	Ground drive pumps not working	Contact your Vermeer dealer.
	Operator Presence system not working	Contact your Vermeer dealer.
	Ground drive neutral light not on	Place joystick in neutral.
Will not move with operator's station in work position	Operator's station proximity switch is faulty, disconnected, or out of adjustment	Contact your Vermeer dealer.
	Ground drive joystick not working	Contact your Vermeer dealer.
	Ground drive pumps not working	Contact your Vermeer dealer.
	Operator Presence system not working	Contact your Vermeer dealer.
	Ground drive neutral light not on	Place joystick in neutral.
No hydraulic power	No hydraulic fluid	Fill with fluid.
	Damaged or worn hydraulic pump(s) or motor(s)	Contact your Vermeer dealer.
	Relief valve damaged	Contact your Vermeer dealer.
	Plugged hydraulic filters or strainer	Replace filters or service strainer.
	Pump control system damaged or not functioning	Contact your Vermeer dealer.

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Symptom	Cause	Solution
Slow hydraulic power	Low hydraulic fluid level	Add hydraulic fluid.
	Plugged hydraulic filters or strainer	Replace filters or service strainer.
	Worn hydraulic pump(s) or motor(s)	Contact your Vermeer dealer.
	Hydraulic pump out of adjustment	Contact your Vermeer dealer.
	Wrong hydraulic fluid viscosity	Change hydraulic fluid.
	Hydraulic fluid cold	Let system warm up before operating hydraulics.
Machine moves with joystick in neutral	Hydraulic pump out of adjustment	Contact your Vermeer dealer.
Machine won't move at all	Operator not in seat	Operator sit in seat
	Operator’s station not locked into work or transport position	Pivot operator’s station to work or transport mode position.
	Operator Presence system not working	Contact your Vermeer dealer.
	Ground drive neutral light not on	Place joystick in neutral.
Not tracking straight	Damaged or worn hydraulic pump or motor	Contact your Vermeer dealer.
	One track is over tensioned	Adjust track tension.

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Engine

This troubleshooting list does not cover all possible symptoms. Refer to manufacturer's Engine Operation Manual for a more comprehensive list.

Symptom	Cause	Solution
Engine hard to start or does not start	Ground drive neutral light not on	Place joystick in neutral.
	No fuel	Add fuel.
	Wrong fuel	Use correct fuel.
	Leak in fuel line	Repair fuel line.
	Dirt or water in fuel system	Remove fuel, clean tank, replace fuel filter, and fuel.
	Fuel filter is dirty	Replace fuel filter.
	Wrong weight engine oil	Use correct engine oil.
	Restricted air filter	Replace air filter.
	Fuel injectors dirty	Contact your Vermeer dealer.
	Cold engine	Wait for preheat timer to expire before cranking.
	Low engine cranking speed	Check battery and battery cable(s) condition. Replace/repair as needed.
Engine lacks power	Fuel filter is dirty	Replace fuel filter.
	Restricted air filter	Replace air filter.
	Fuel injectors dirty	Contact your Vermeer dealer.
	Wrong fuel	Use correct fuel.
	Engine is overheated	Contact your Vermeer dealer.

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Low battery charge	Alternator not charging	Contact your Vermeer dealer.
	Worn or damaged alternator drive belt	Tighten or replace belt.
	Loose or corroded battery cables	Clean and tighten cables.
	Defective battery cell	Replace battery.
Remote control will not work	No/low power	Replace batteries.
	Remote not communicating	Register remote.
	Remote locked out	Remove operator from seat.
		Put operator's station controls in neutral.
		Enable remote with correct key sequence.
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Section 70: Specifications

Lubricants

Lubricant/Capacity	Specifications
Engine oil with filter: **Deutz:** 9.5 qt (9 L) **Yanmar:** 7.8 qt (7.4 L)	An Engine Operation Manual is supplied with each machine. Refer to the manual for engine service requirements.
Hydraulic tank: 36 gal (136 L) ***NOTICE:*** Do not spill dirt or other contaminants into the tank. Filter all fluid through a 10-micron filter before adding. ***NOTICE:*** Use of other hydraulic oil without written factory approval jeopardizes warranty.	**ISO 68 Oil**: -10° – 100°F (-23° – 38°C) Vermeer HyPower 68, Shell Tellus T-68, or Mobil DTE16M **[Below 23°F (-5°C), refer to starting procedure]** **ISO 100 Oil**: 10 – 120°F (-12 – 49°C) Vermeer HyPower 100, Shell Tellus T-100, or Mobil DTE18M **[Below 41°F (5°C), refer to Starting Procedure]**
Grease	**EP grease**: Vermeer LC Ultra or equivalent
Hammer grease	Chisel paste
Planetary oil: all-purpose gear lube 31 oz (920 ml) per planetary; 62 oz (2 L) total	Oils must conform to API GL5 or MIL-L-2105D specifications. -20 – 100°F (-29 – 38°C): 80W-90 20 – 120°F (-7 – 49°C): 85W-140
Coolant: **Deutz:** 1.7 gal (6.4 L) **Yanmar:** 1.5 gal (5.7 L)	Use a 50/50 mixture of Extended Life (ELC) Nitrite-Free (NF) coolant and distilled or deionized water. Never add pure antifreeze to the system; always dilute to a 50/50 mixture. Never use Supplemental Cooling Additives (SCAs) with ELC coolant. Refer to the Engine Operation Manual.
Lift chain lubricant	Dry spray lubricant

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Machine Specifications

Deutz Engines				
Model	Deutz D2.9L4 Tier 4 Final/Stage IIIA	Deutz D2.9L4 Tier 4 Interim/Stage IIIA	Deutz TD2.9L4 Tier 4 Interim/Stage IIIB	Yanmar 4TNV88 Tier 4 Interim/Stage IIIB
Maximum power (net)	49 hp (37 kW) at 2,600 rpm		67 hp (50 kW) at 2,600 rpm	47 hp (35 kW) at 3,000 rpm
Fuel capacity	28 gal (106 L)			
Fuel type	Tier 4 engines require Ultra Low Sulfur Diesel (ULSD) fuel, with sulfur content less than 15 ppm (15 mg/kg). Use of fuels other than what is specified in the engine manual will impact engine performance, damage engine emissions systems and may result in engine and exhaust system warranty being voided.			
Maximum engine inclination	30° all directions ***NOTICE:*** Maximum engine inclination angle does not indicate safe machine operating angle.			
Battery (1)	12-volt negative ground, 950 cold cranking amps, 30 sec @ 0°F (-18°C) Reserve capacity: 195 min. of 25-amp output @ 80°F (27°C)			
Hydraulic pump	Sauer Danfoss H1 hydrostatic			

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Remote Controls		
Model	R524J 6-Button	
Batteries / life	Six – AA / 40 hours	
Normal range	100 ft (30 m)	
Maximum recommended range	300 ft (91 m)	
Maximum oil flow	27 gpm (102 L/min)	
Maximum pile dimension	**Standard Opening – 170 mm:** Round: 7.2 in (18.3 cm) diameter Square: 6.2 in (15.8 cm) Rectangular: 4.6 x 7.2 in (11.7 x 18.3 cm)	**Large Opening – 225 mm:** Round: 9.3 in (23.6 cm) diameter Square: 8.3 in (21.1 cm) Rectangular: 6.7 x 9.3 in (17 x 23.6 cm)
Hammer		
Hammer energy class	738 ft-lb (1000 J), 1,500 blows per minute maximum ***NOTICE:*** Do not use hammer without pile or post.	
Working pressure	1,700 psi (117 bar)	
Minimum oil flow	14 gpm (53 L/min)	
Maximum oil flow	27 gpm (102 L/min)	
Maximum pile dimension	**Standard Opening – 170 mm:** Round: 7.2 in (18.3 cm) diameter Square: 6.2 in (15.8 cm) Rectangular: 4.6 x 7.2 in (11.7 x 18.3 cm)	**Large Opening – 225 mm:** Round: 9.3 in (23.6 cm) diameter Square: 8.3 in (21.1 cm) Rectangular: 6.7 x 9.3 in (17 x 23.6 cm)
Laser (Option)		
Laser receiver	Trimble LR410	
Operating distance	1,500 ft (457.2 m) maximum	

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Operational Dimensions

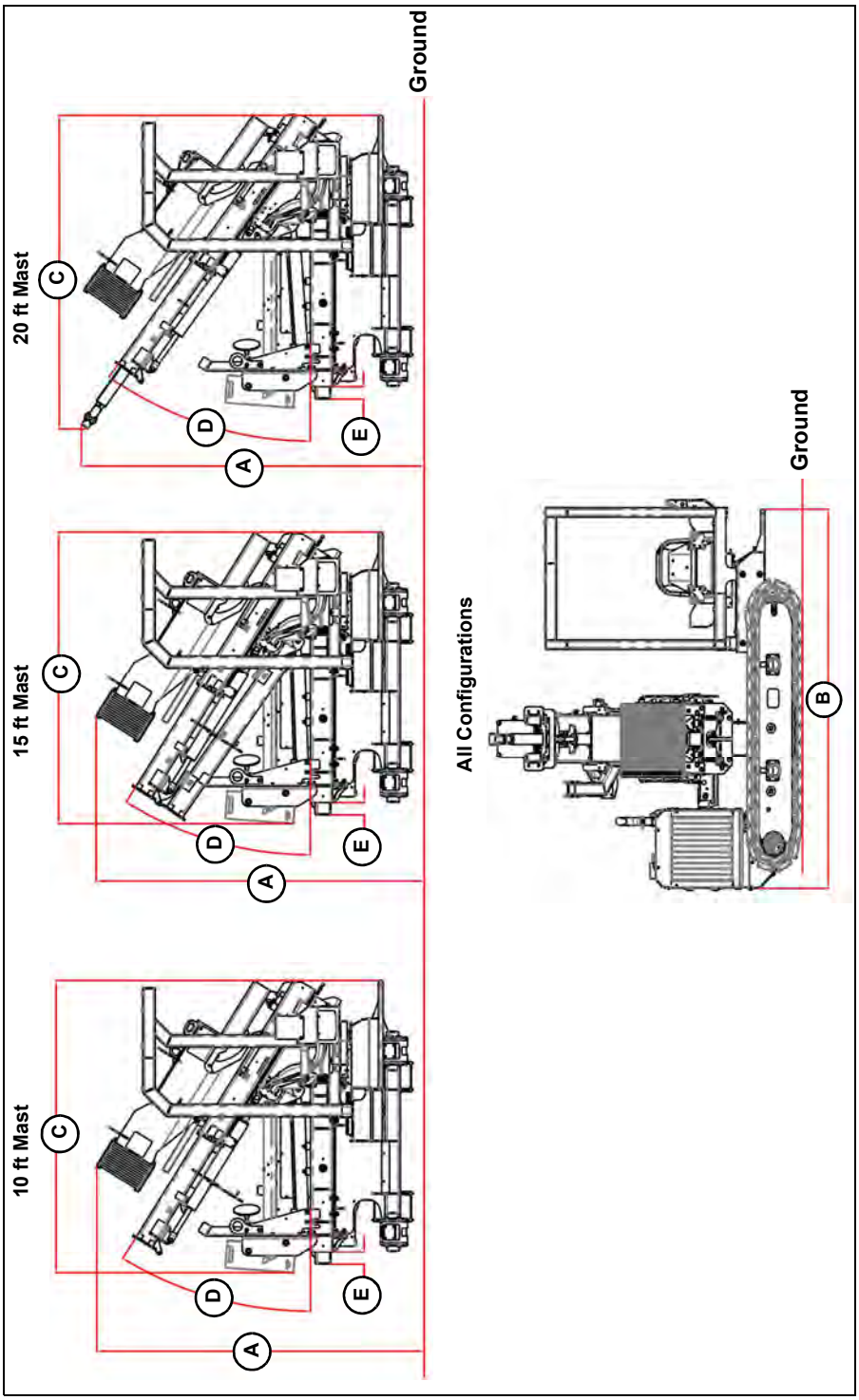
	10 ft (3.1 m) Mast	**15 ft (4.6 m) Mast**	**20 ft (6.1 m) Mast**
Max. Operating Height (max. height may increase with installation of a compatible third-party GPS system)	179 in (455 cm)	239 in (607 cm)	299 in (760 cm)
Max. Operating Length	122 in (310 cm)		
Min./Max. Operating Width	121 in (307 cm) / 145 in (368 cm)		
Machine Weight	14,135 lb (6412 kg)	14,320 lb (6 495 kg)	15,590 lb (7 072 kg)
Composite mast/hammer frame weight (pivot frame, hose carrier, mast base, hammer carriage w/ hammer, lower mast	2717 lb (1232 kg)	2,917 lb (1 323 kg)	3,127 lb (1 418 kg)
Mast Angle (front/back)	5° front/back with hammer low; 5° front/20° back with hammer high		
Mast Angle (left/right)	11° hammer low/5° hammer high		
Mast Extension	NA	5 ft (1.5 m)	2 pieces at 5 ft (1.5 m) = 10 ft (3 m)
Max. Pile Height	10 ft (3 m)	15 ft (4.6 m)	20 ft (6.1 m)

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Transport Dimensions

	10 ft (3.1m) Mast	**15 ft (4.6 m) Mast**	**20 ft (6.1 m) Mast Bottom section removed and hose carrier lowered.**	**20 ft (6.1 m) Mast With tilt cylinder positioner and hose carrier lowered.**
Max. Transport Height **(A)**	108 in (274 cm)			112 in (284 cm)
Max. Transport Length **(B)**	122 in (310 cm)			
Max. Transport Width **(C)**	98.7 in (251 cm)	94.3 in (240 cm)	101.5 in (258 cm)	100.5 in (255 cm)
Lateral Mast Tilt Angle **(D)**	32°			38°
Lateral Mast Slide Length **(E)**	8.5 in (21.6 cm)		7.5 in (19.1 cm)	8.5 in (21.6 cm)
Reference illustration on next page.				

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Ground
20 ft Mast
C
D
E
A
15 ft Mast
C
D
E
A
10 ft Mast
C
D
E
A
All Configurations
Ground
B

Counterweights

Weight Configuration for S/N 1001 – 2000

Configuration for 10-ft Mast Machine

Requires standard weight kit **(1)**.

Configuration for 15-ft Mast Machine

Includes standard weight kit **(1)** and adds either a second row of weights **(2)**, or weights on track frame **(3)**.

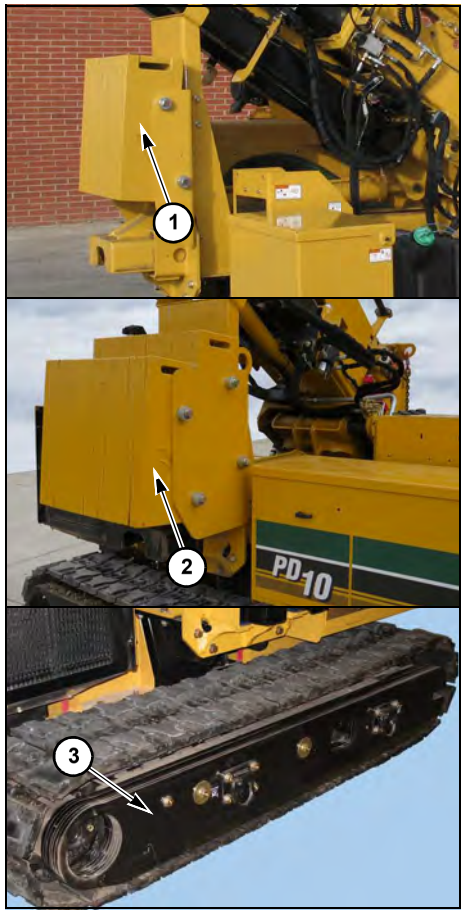
Configuration for 20-ft Mast Machine

Requires standard weight kit **(1)** and undercarriage weights (not shown).

Weight Configuration for S/N 2001 –

All configurations require standard weight kit **(1)** and undercarriage weights (not shown).

Weights on track frame **(3)** are required for 20-ft mast, in addition to single row of weights **(1)**, and undercarriage weights (not shown).



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Revision History

Revision	Date	Page(s)	Description
o-m1_00	05/12	All	Production manual released.
o-m2_00	07/13	All	Second edition production manual
o-m2_05	12/19	Front, Section 16, 30-5, 30-6, 30-7, 30-10, 30-11, 30-12, 30-14, 40-10, Section 60, 70-1	Updated safety graphics, warranty, corrected Yanmar oil capacity, moved Welding Statement to Maintenance section, updated for new telematics, updated transporting machine section.
o-m2_06	12/20	Receiving and Delivery vi, Section 15-1, Section 20-1, 20-21, 20-29, 20-30, 20-31, 20-37, 20-38, Section 21 all, Section 50-12 through 21, Section 22-4, Section 23-1, Section 60-2, 60-7, 60-54, Section 70-3.	Updated remote controller picture in Receiving and Delivery. Added new operator note. Added remote control messages and location of remote control. Added inclinometer information. Updated Section 21. Added 60 second delay and low idle notes. Added remote control test at 100 hours maintenance. Added note for replacing remote batteries. Added remote control specs.
o-m2_07	04/22	Front, 30-16, 30-18, 60-3, 60-12, 70-1, 70-2, Back	Updated tow point, fuel tank, controller change, engine oil capacity
o-m2_08	02/23	All	Updated to style guide, updated GPS antenna mount location
o-m2_09	12/23	All	USB video, planned maintenance, hammer lift roller, style guide updates
o-m2_10	05/25	Front, 60-12, 13, 14, 33,	Updated introduction boiler plate, hammer lift roller, hammer lifting chain, hammer chain nut

When operated in California, any off-road diesel vehicle may be subject to the California Air Resources Board In-Use Off-Road Diesel Vehicle Regulation. It therefore could be subject to retrofit or accelerated turnover requirements to reduce emissions of air pollutants. For more information, please visit the California Air Resources Board website at http://www.arb.ca.gov/msprog/ordiesel/ordiesel.htm.

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Response to Siting Board_RFI_1-46 - Revised Noise Report
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CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

CALIFORNIA
Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

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1210 Vermeer Road East, P.O. Box 200
Pella, Iowa 50219-0200 USA

Siting Board 1-47:

Refer to the SAR, Appendix E, Noise Analysis at 12. Explain the basis for the statement that solar pile drivers are quieter than other pile drivers.

Response: The Federal Highway Administration Construction Noise Handbook, Chapter 9[1], lists the typical noise level for an impact pile driver as 101 dBA at 50ft from the source. A review of sound emission data for Pileco Inc. diesel hammers, which are used to drive piles into soil for structures like buildings and bridges, supports the average sound level provided by FWHA. The estimated sound levels for the Pileco Inc. pile drivers range from 88.3 to 107.3 dBA 50ft from the source[2]. In comparison, the pile driver anticipated to be used is the Vermeer PD10, which is expected to have noise levels of approximately 80.6-89.6 dBA at 50ft from the source, depending on the engine used. See Attachment 1-47 for the Vermeer PD10 operator's manual.

Witness: Marty Marchaterre

PD10 Pile Driver

Operator's and Maintenance Manual



EN_o-m2_10 original instructions
Publication Date: 2025-05-06
Serial No. 1001 -
Order No. 105400CQ3
Cabled Assembly No. 296379241

Vermeer® | EQUIPPED TO DO MORE.®

Introduction

The Operator’s and Maintenance Manuals explain the proper operation and maintenance of your machine. Study and understand these instructions thoroughly before operating or maintaining your machine.

Do not attempt any maintenance procedures unless they are fully understood and can be safely and accurately performed with the available tools and equipment. Failure to do so could result in personal injury or equipment damage. If you do not understand the instructions in these manuals or need additional information, contact your Vermeer dealer.

The maintenance intervals are based on normal operating conditions. When operating under severe conditions, the maintenance intervals should be more frequent.

Instructions, illustrations, and specifications in these manuals are based on the latest information available at the time of publication. Your machine may have product improvements, options, or features not yet contained in these manuals.

To provide a better view, some photographs or illustrations may show the machine shields removed. **Never operate the machine with shields removed - keep all shields in place**. If removing a shield is necessary, return it to its correct position before operating the machine.

Access to, and use of any software installed on the machine is subject to the Master Software License and Terms of Use for Vermeer Productivity Tools. For additional information, contact your Vermeer dealer.

Two Operator’s and one Maintenance Manual are provided with each machine. The tethered (cabled) manual must remain attached to the machine for immediate reference; store the second manual in a safe location. The Maintenance Manual should also be kept on the machine and referenced for all lubrication and maintenance procedures. When not in use, manuals should be kept in the manual storage box.

To order additional copies of the Manuals and the Operation and Safety Video (if available) from your dealer, use the reorder number on the front cover. Copies are also available in Spanish from your dealer. Other languages may also be available.

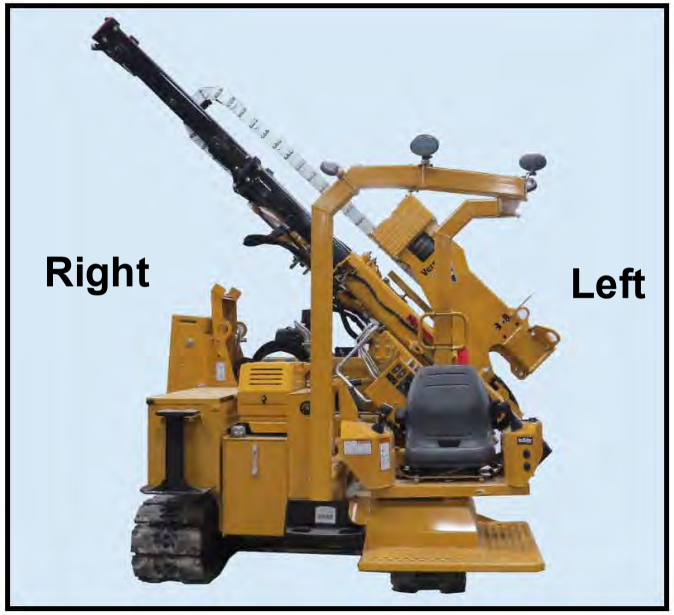
Vermeer Corporation reserves the right to make changes at any time without notice or obligation.

Su distribuidor dispone de ejemplares en español de este manual.

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Barrelhead Solar, LLC

Notice to Owner

Replacement manuals are free of charge by registering your **used** Vermeer machine. Your machine's Operator's, Maintenance, and Parts Manuals may be available online at www.myvermeer.com. For questions about online or printed manuals, or to register a used machine, contact the data analytics department by telephone: 800-829-0051 or 641-628-3141; email: dataanalytics@vermeer.com; internet: www.vermeer.com or www.myvermeer.com; or letter: Data Analytics Department, Vermeer Corporation, P.O. Box 200, Pella IA 50219 USA.



Orientation: Right and left sides of the machine are determined by direction of forward travel in transport position as shown.

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Trademarks

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Vermeer New Industrial Equipment Limited Warranty

Effective November 1, 2021 **Warranty period: 12 months / 1000 hours**

Vermeer Corporation (hereinafter "Vermeer") warrants each new Industrial product of Vermeer's manufacture to be free from defects in material and workmanship, under normal use and service for one (1) full year after initial purchase/retail sale or 1000 operating hours, whichever occurs first. This Limited Warranty shall apply only to complete machines of Vermeer's manufacture, parts are covered by a separate Limited Warranty. **EQUIPMENT AND ACCESSORIES NOT OF VERMEER'S MANUFACTURE ARE WARRANTED ONLY TO THE EXTENT OF THE ORIGINAL MANUFACTURER'S WARRANTY AND SUBJECT TO THEIR ALLOWANCE TO VERMEER ONLY IF FOUND DEFECTIVE BY SUCH MANUFACTURER.**

EXTENDED WARRANTY OPTIONS ARE AVAILABLE FOR PURCHASE

WARRANTY TERMS During the Limited Warranty period specified above, any defect in material or workmanship in any warranted item of Vermeer Industrial Equipment not excluded below shall be repaired or replaced at Vermeer's option without charge by any authorized independent Vermeer dealer. The warranty repair or replacement must be made by a Vermeer independent authorized dealer at the dealer's location. Vermeer will pay for replacement parts and such authorized dealer's labor in accordance with Vermeer's labor reimbursement policy. Vermeer reserves the right to supply remanufactured replacement parts as it deems appropriate.

RETAIL PURCHASER RESPONSIBILITY: This Limited Warranty requires proper maintenance and periodic inspections of the Industrial Equipment as indicated in the Operator's/Maintenance Manual furnished with each new Industrial Equipment. The cost of routine or required maintenance and services is the responsibility of the retail purchaser. The retail purchaser is required to keep documented evidence that these services were performed. This Vermeer New Industrial Equipment Limited Warranty may be subject to cancellation if the above requirements are not performed. Vermeer Industrial Equipment with known failed or defective parts must be immediately removed from service.

EXCLUSIONS AND LIMITATIONS

The warranties contained herein shall **NOT APPLY TO:**

(1) Any defect which was caused (in Vermeer's sole judgment) by other than normal use and service of the Industrial Equipment, or by any of the following; (i) accident (ii) misuse or negligence (iii) overloading (iv) lack of reasonable and proper maintenance (v) improper repair or installation (vi) unsuitable storage (vii) non-Vermeer approved alteration or modification (viii) natural calamities (ix) vandalism (x) parts or accessories installed on Industrial Equipment which were not manufactured or installed by Vermeer authorized dealers (xi) the elements (xii) collision or other accident.

(2) Any Industrial Equipment whose identification numbers or marks have been altered or removed or whose hour meter has been altered or tampered with.

(3) Any Industrial Equipment which any of the required or recommended periodic inspection or services have been performed using parts not manufactured or supplied by Vermeer or meeting Vermeer Specifications including, but without limitation, engine tune-up parts, engine oil filters, air filters, hydraulic oil filters, and fuel filters.

(4) New Industrial Equipment delivered to the retail purchaser in which the equipment/warranty registration has not been completed and returned to Vermeer within ten (10) days from the date of purchase.

(5) Any defect which was caused (in Vermeer's sole judgment) by operation of the Industrial Equipment not abiding by standard operating procedures outlined in the Operator's Manual.

(6) Engine, battery, and tire Limited Warranties and support are the responsibility of the respective product's manufacturer.

(7) Transportation costs, if any, of transporting to the Vermeer dealer. Freight costs, if any, of transporting replacement parts to the Vermeer dealer.

(8) The travel time of the Vermeer dealer's service personnel to make a repair on the retail purchaser's site or other location.

(9) In no event shall Vermeer's liability exceed the purchase price of the product,

(10) Vermeer shall not be liable to any person under any circumstances for any incidental or consequential damages (including but not limited to, loss of profits, out of service time) occurring for any reason at any time.

(11) Diagnostic and overtime labor premiums are not covered under this Limited Warranty Policy. Oils and fluids are not covered under this Limited Warranty.

(12) Depreciation damage caused by normal wear, lack of reasonable and proper maintenance, failure to follow operating instructions, misuse, lack of proper protection during storage.
(13) Accessory systems and electronics not of Vermeer's manufacture are warranted only to the extent of such manufacturer's respective Limited Warranty if any.
(14) Down hole toolage is not covered under this warranty.
(15) Wear items which are listed below:

antenna, augers, base plates, bearing seals, bearings, belts, brake pads, brushes, bolts/torqued parts, boom wear items, booms, brake pads, bushings, buckets, cable fingers, chain, clamping vise parts, clutches, clutch components, conveyor belts, cups, curtains, cutter wheels, dies, digging chain, digging rims, discharge conveyor belts, drive chuck, drums, earth stakes, end idler, end rollers, fan belts, flails, flashings, hammers, hoses, infeed conveyor belts, infeed conveyor chains, jaws, knives, leaf chain, lights, lights on light kits, liners, outer drum bearings, packing assemblies, pins and bushings, pins and pivot points, piston cups, pivot rings, plastic wear strips, plow blades, plungers, pockets, rods, rollers, rod loader parts, rooter bands, rotor plates, rubber grouser bars, rubber or plastic items, rubber tracks, rubber track bands, rubber shielding, scraper knives, screens, seals, service items, shear bar/bedknife, skid shoes, sprockets, teeth, tips, tip mounts, tires, thrust wheels, tooling, track chain, track guides, track idlers, track pads, track rollers, track sprockets, trench cleaner (crumber), trip cleaners, trommel brushes, trommel screen panels, trunnion and pivot points, valves, valve seats, water hoses, water swivels, wear bars, wear blocks, wear plates, wear strips, wheels, winch cable, windshield wiper parts.

PARTS WARRANTY:

Parts replaced in the warranty period will receive the balance of the first year New Industrial Equipment Limited Warranty, during the first (12) months or 1000 hours, whichever comes first. Replacement parts after the original machine warranty, are warranted to be free from defects of material for ninety (90) days or the part will be repaired or replaced, without labor coverage for removal and reinstallation.

EXCLUSIONS OF WARRANTIES: EXCEPT FOR THE WARRANTIES EXPRESSLY AND SPECIFICALLY MADE HEREIN, VERMEER MAKES NO OTHER WARRANTIES, AND ANY POSSIBLE LIABILITY OF VERMEER HEREINUNDER IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. VERMEER RESERVES THE RIGHT TO MODIFY, ALTER AND IMPROVE ANY PRODUCT WITHOUT INCURRING ANY OBLIGATION TO REPLACE ANY PRODUCT PREVIOUSLY SOLD WITH SUCH MODIFICATION. NO PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY, OR TO ASSUME ANY ADDITIONAL OBLIGATION ON VERMEER'S BEHALF.

NO DEALER WARRANTY. The selling dealer makes no warranty of its own and the dealer has no authority to make any representation or promise on behalf of Vermeer or to modify the terms or limitations of this warranty in any way.

ELECTRONIC SIGNATURES. Each of the parties hereto expressly agrees to conduct transactions by electronic means. Accordingly, the parties agree and intend that all electronic transmissions including, without limitation, electronic signatures, shall be considered equivalent to an original writing as provided under Iowa law, as it may be amended from time to time.

MANUFACTURED BY:
VERMEER CORPORATION
1210 Vermeer Road East, P.O. Box 200
Pella, Iowa 50219-0200 USA

Telematics Equipment Notice and Consent

This machine may be equipped with Vermeer GPS tracking equipment that collects and transmits data about the machine's performance and location. This data is collected by Vermeer and held, used and shared consistently with the terms of the Vermeer Privacy Policy and any applicable provisions of the End User License Agreement ("EULA") which may be found at: http://www2.vermeer.com/vermeer/NA/en/N/privacy and http://telematics.vermeer.com.

Machine owner and designated representatives ("subscribers") may access the data through a subscription based website called Vermeer Telematics (formerly known as Vermeer Fleet/Fleet Edge). Use of Vermeer Telematics is subject to the subscriber's acceptance of the terms and conditions of use and payment of any applicable subscription or license fees. If you are a current subscriber, you may obtain a copy of the currently effective terms and conditions through your login or by contacting appsupport@vermeer.com.

More information about Vermeer Telematics may be found at: http://store.vermeer.com.

Machine owner may opt-out of the telematics service and collection of data by Vermeer Telematics at any time by contacting your Vermeer dealer or appsupport@vermeer.com.

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Receiving and Delivery Report

Dealer Prep

Check or perform the following:

General

___ Check for shipping damage or shortage.
___ Check that Operator's Manual is attached to the machine.
___ Check for correct lubrication.
___ Check bolts for tightness.
___ Check installation and condition of all shields.
___ Check condition of all safety signs and operation decals.
___ Check seat belt installation and operation. Refer to *page 60-29.*
___ Check operation of neutral start interlock system. Refer to *page 60-25.*
___ Check operation of operator presence system. Refer to *page 60-27.*
___ Check track tension. Refer to *page 60-63.*
___ Check operation of instruments and lights. Refer to *page 20-2.*
___ Check all phases of operation. Refer to *page 20-2.*

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Engine

___ Check oil level in engine.

___ Check level and concentration of coolant.

___ Check condition of air cleaner.

___ Check battery electrolyte level and charge.

___ Check air intake clamps.

___ Check radiator hose clamps.

___ Check belts for correct tension. Refer to Engine Manufacturer Operator's Manual.

___ Check operation of engine.

Hydraulics

___ Check hydraulic fluid level.

___ Check all hydraulic components for leaks or damage.

___ Check controls for correct function. Refer to *page 20-1.*

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Delivery

Check and perform the following with the customer:

___ Review contents of the HDD Resource Library.

___ Review the DVD on Horizontal Directional Drilling.

___ Review all sections of the operator’s manual.

___ Review welding alert and location of electronic modules to unplug. Refer to *page 60-2.*

___ Grease or oil all lubrication points.

Review and demonstrate with the customer the various aspects of pile driver operation:

___ Overall explanation of how the pile driver works.

___ Pile driver safety.

___ Preparing the pile driver for operation. Refer to *page 40-1.*

Response to Siting Board_RFI_1-47 - Vermeer Pile Driver Operator's and Maintenance Manual - Page 1 of 285
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Dealer/Owner Information

dealer	owner
address	address
city	city
state/province	state/province
zip/postal code	zip/postal code
country	country
phone number	phone number
email address	email address

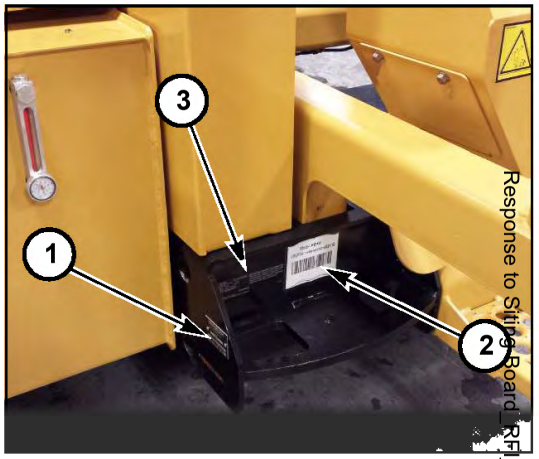
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Barrelhead Solar, LLC

Identification Numbers – Record

Machine Model Number **(1)** _____

Machine Serial Number **(1)** _____



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Machine Identification Decal

This decal **(2)** contains a barcode with the machine’s vehicle identification number (VIN). It can be scanned with any barcode reading device.

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Engine Identification Numbers – Record

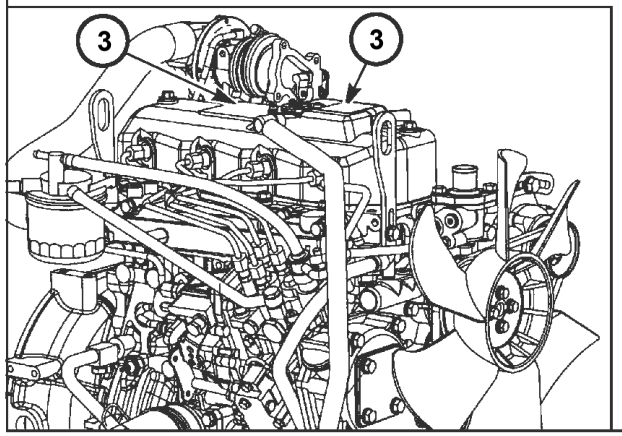
Engine Identification tags **(3)** are located on top of engine and next to machine identification decal.

Engine Model Number

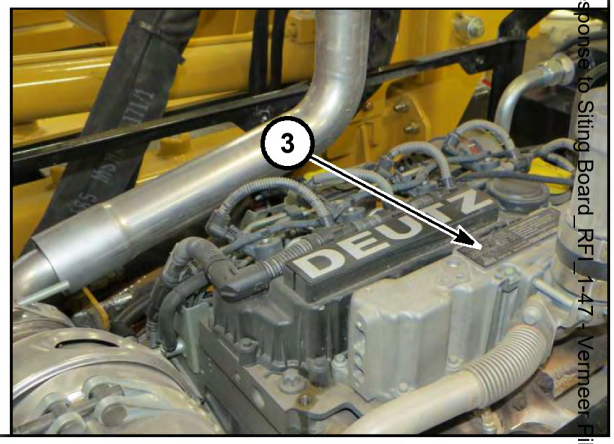
_____

Engine Serial Number _____

Yanmar engine



Deutz engine



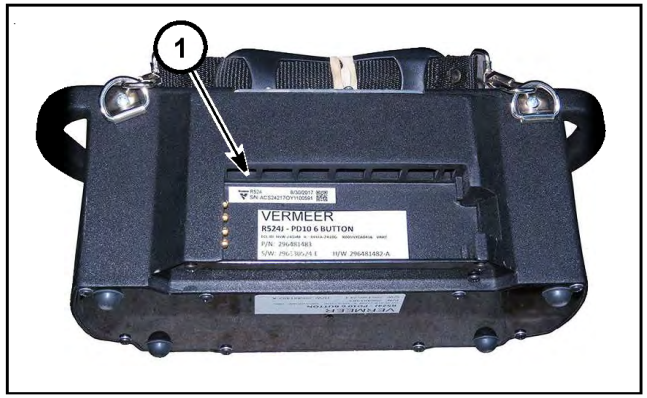
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Remote Control Identification Numbers – Record

Remove battery pack to view remote control identification numbers.

Remote Control Model Number **(1)** _____

Remote Control Serial Number **(1)** _____



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Section 10: Safety Messages

General safety messages are in this Safety Messages section. Specific safety messages are located in appropriate sections of the manual where a potential hazard may occur if the instructions or procedures are not followed.

A signal word **DANGER**, **WARNING**, or **CAUTION** is used with the safety alert symbol.

Safety signs with signal word **DANGER**, **WARNING**, or **CAUTION** are located near specific hazards.

DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information considered important, but not hazard-related.

Safety Symbol Explanation

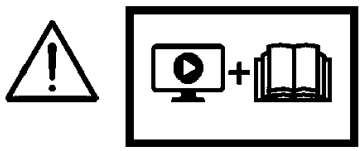


This is the safety alert symbol. This symbol is used in combination with an exclamation mark or other symbols to alert you to the potential for death or serious injury.

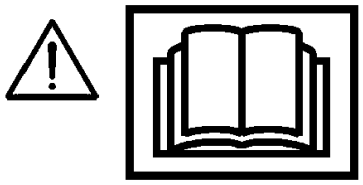


This symbol indicates that at least one part of the machine is not operating correctly.
Shutting down the machine may not be necessary, but some maintenance may be required.

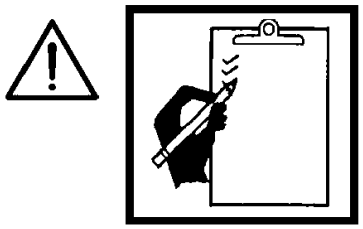
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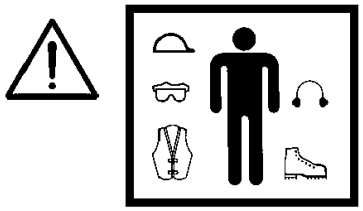
WARNING: Read Operator's Manual and safety signs, and watch the operations and safety video, before operating machine.



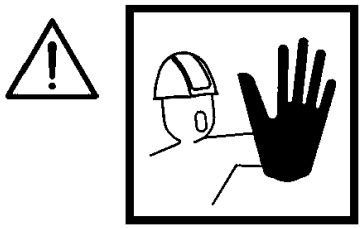
WARNING: Read Operator’s Manual and safety signs before operating machine.



WARNING: Check machine before operating. Machine must be in good operating condition and all safety equipment installed and functioning correctly.



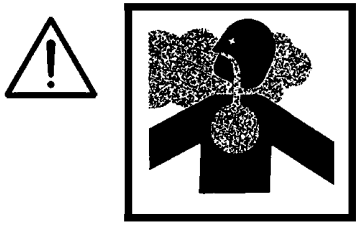
WARNING: Wear personal protective equipment. Wear close-fitting clothing and confine long hair. Additional personal protection requirements are explained separately. Refer to “Personal Protection,” *page 40-5*.



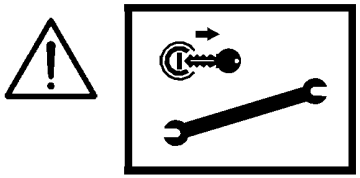
WARNING: Keep all spectators away.

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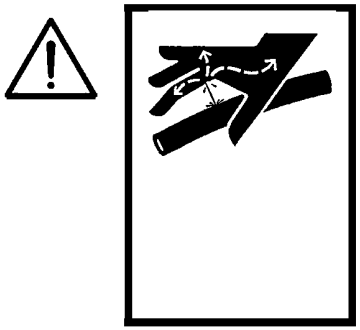
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WARNING: Engine exhaust can asphyxiate or poison resulting in death or serious injury. Operate machine outdoors. If it is necessary to operate engine in an enclosed area, properly vent exhaust gases.

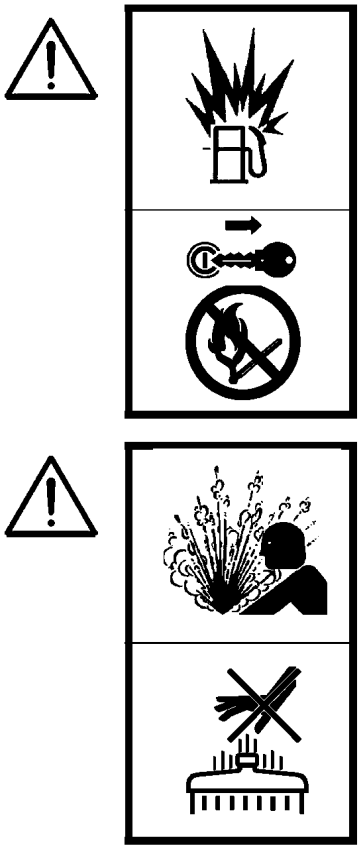


WARNING: Failure to use shutdown procedure can result in unexpected hazard(s). Death or serious injury could result due to entanglement, crushing, cutting, or other hazardous contact. Follow Shutdown Procedure after operating, before performing any service or maintenance, and before transporting. Refer to *Shutdown Procedure, page 23-1*.



WARNING: Pressurized fluid can penetrate body tissue and result in death or serious injury. Leaks can be invisible. Keep away from any suspected leak. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing any other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

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WARNING: Fuel and fumes can explode and burn.

Shut off engine before refueling. No flame. No smoking.

WARNING: Hot fluid under pressure can scald.

Allow engine to cool before opening radiator cap.

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WARNING: Do not use the hammer to lift people.

WARNING: Make no modifications to your equipment unless specifically recommended or requested by Vermeer Corporation.

WARNING: Be sure that all safety devices, including shields, are installed and functioning correctly after servicing the machine.

WARNING: Failure to follow any of the preceding safety instructions or those that follow within this manual, could result in death or serious injury. This machine is to be used only for those purposes for which it was intended as explained in the Operator's Manual.

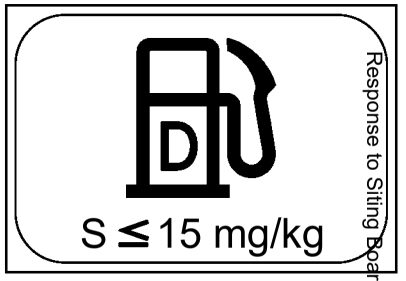
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Section 12: Diesel Fuel Recommendations

Diesel Fuel – Sulfur Content

Tier 4 engines require Ultra Low Sulfur Diesel (ULSD) fuel, with sulfur content less than 15 ppm (15 mg/kg). Use of fuels other than what is specified in the engine manual will impact engine performance, damage engine emissions systems and may result in engine and exhaust system warranty being voided.



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Section 15: Intended Use

The PD10 Pile Driver is a self-propelled machine designed to drive metal piles or posts into the ground.

Always use this machine in accordance with the instructions contained in this manual, on safety signs on the machine, and in other materials provided by Vermeer Corporation.

Proper maintenance and repair are essential for safe and efficient machine operation. Do not use the machine if it is not in suitable operating condition.

In addition, ensure new operator is familiar with all the safety signs and control operations.

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Section 16: Vermeer Productivity Tools

Vermeer GPS Tracking Equipment (Telematics)

- Serial numbers 1001 – 3000 may be equipped with Vermeer GPS tracking equipment.
- Serial numbers 3001 and up are equipped with Vermeer GPS tracking equipment.

Vermeer uses GPS tracking equipment to collect data about the machine's performance and location. When activated, the telematics control unit (TCU) transmits the data to a subscription-based website called Vermeer Telematics (formerly known as Vermeer Fleet/Fleet Edge). Subscribers can access the data through a computer or mobile device.

Each subscription is valid for a current registered owner's specific machine. The subscription cannot be transferred to another machine or to a new machine owner.

- After subscribing, go to http://telematics.vermeer.com and refer to the bulletin for instructions on accessing the user's guides.
- Subscriptions can be canceled at any time by contacting your local Vermeer dealer or emailing appsupport@vermeer.com.
- Subscribers must notify appsupport@vermeer.com to cancel a subscription when selling a machine.

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There are two levels of data access, as well as a third option which turns off the system.

- Full Implementation – The subscription owner, Vermeer, and authorized dealers can all access the data. A new machine, manufactured by Vermeer Corporation and equipped with telematics, automatically begins transmitting data to Vermeer and its authorized dealer. The owner must activate the subscription to access the data. For more information on subscribing, contact your Vermeer dealer or email appsupport@vermeer.com
- Partial Implementation – Only the registered owner and Vermeer Corporation can access the data. To select this option, contact your dealer or email appsupport@vermeer.com.
- Shut System Off – To discontinue data collection and turn off the system, email appsupport@vermeer.com.

Used Machines – to activate machine telematics after purchasing a used machine:

Step 1: View the compatible machine list online at http://store.vermeer.com, or contact your local Vermeer dealer or email appsupport@vermeer.com to determine if machine telematics is available for installation.

Step 2: Contact your dealer or email appsupport@vermeer.com to ensure that any previous subscription related to your machine has been canceled.

For more information, contact your Vermeer dealer or email appsupport@vermeer.com.

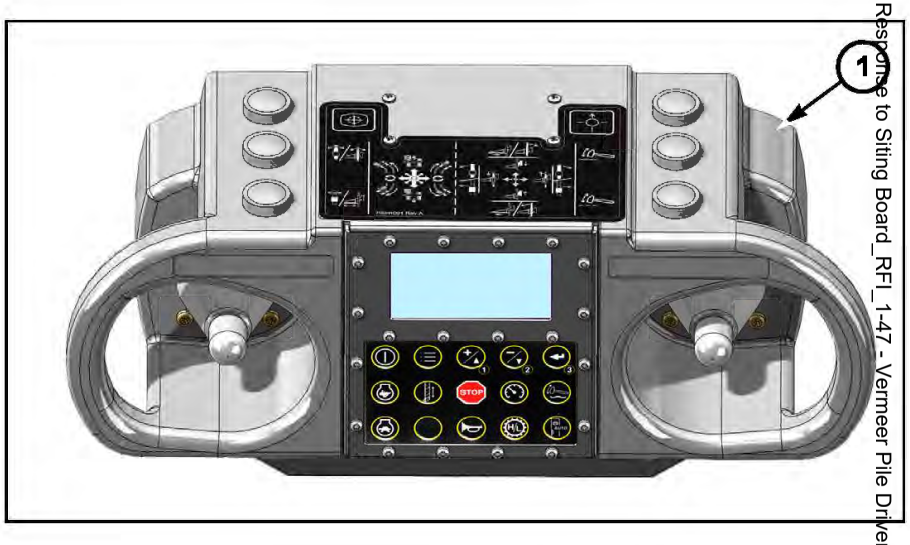
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Section 20: Controls

Optional Remote Control

Operations of the remote control **(1)** are detailed in the remote-control section of this manual. Refer to “Optional Remote Control,” *page 21-1.*

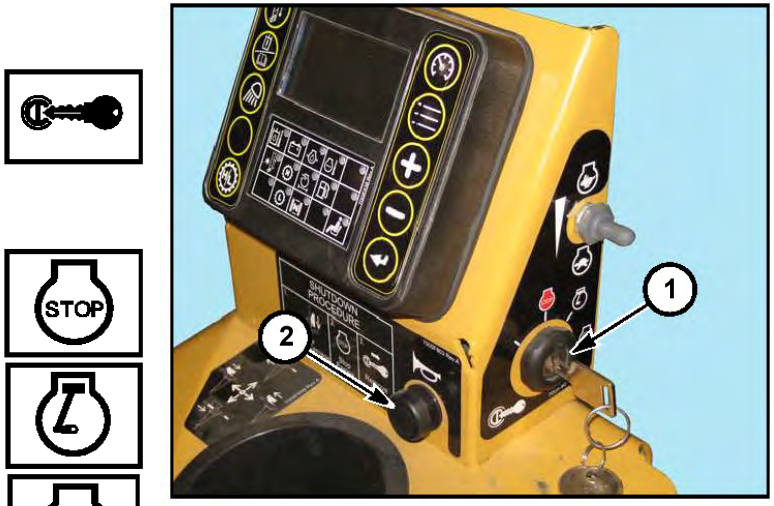
The remote control is stored inside the toolbox. Refer to “Access – Storage For Optional Remote Control,” *page 20-21.*



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Engine Controls

(1) *Keyswitch*



Counterclockwise . . . . . .not used

Vertical position . . . . . **off**

First position clockwise . . . . . **run/electrical system on**



Second position clockwise . . . . . **start**

Release key immediately after engine starts.

If either transport or operation controls are out of neutral, engine will start but machine will not function. Screen will show “RESET” *left joystick* or *reset right joystick*.

(2) *Horn*



Press . . . . . **horn sounds**

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(3) *Throttle switch*



Push up. . . . . **increase rpm**





Push down . . . . . **decrease rpm**



(4) *Battery disconnect switch*

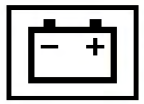


Rotate key **counterclockwise** . . . . . **disconnect ground**

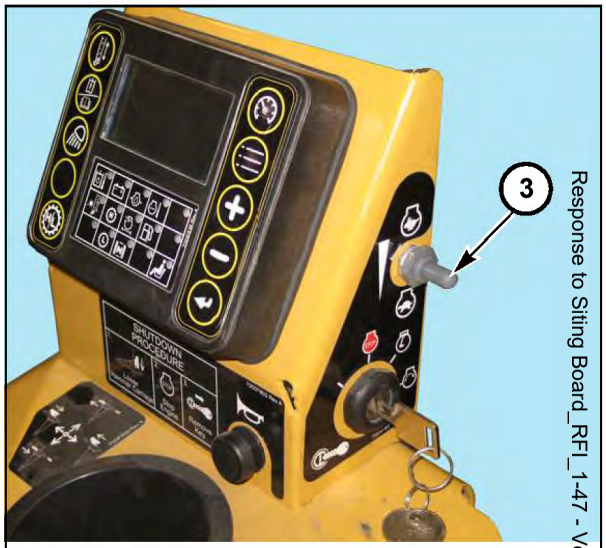


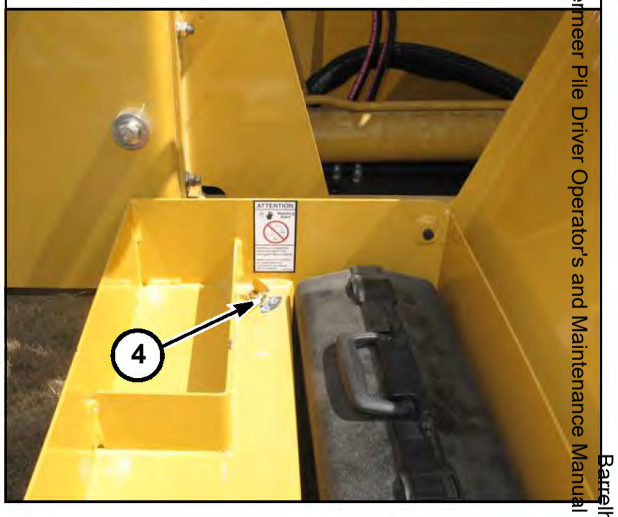


Rotate key **clockwise**. . . . . **connect ground**



NOTICE: Do not disconnect battery power with *keyswitch* on. Damage to controller could result.



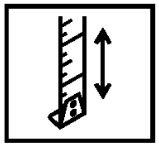


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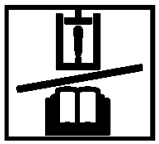
Controller Keys

(1) *Measure mode key*
Press to toggle through the following measure modes:

- Manual
- Laser elevation (option)
- Laser elevation with GPS X/Y (option)
- GPS X/Y (option)
- GPS X/Y/Z (option)



(2) *Valve reset key*
Press. . . . . **reset control valve and clear valve faults**



(3) *Work lights key*
Press. . . . . **turn work lights on/off**

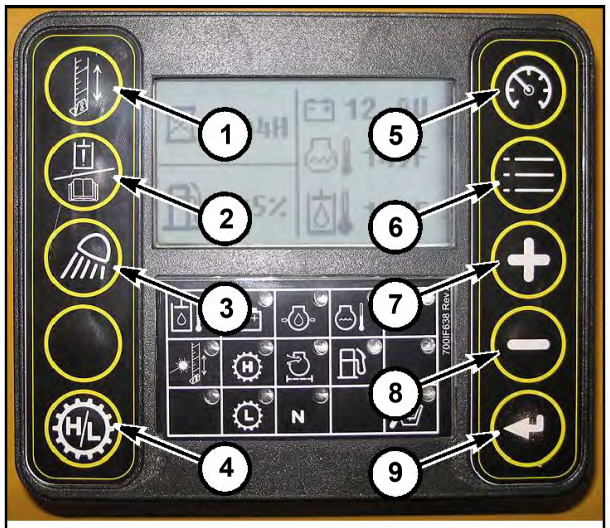


(4) *Ground drive speed key*
Press. . . . . **toggle between high and low ground drive speeds**



(5) *Engine key*
Press. . . . . **toggle between main screen and engine screen**
Refer to “Controller Screens,” *page 20-24.*





Keys 5, 6, 7, 8, and 9 are always available regardless of whether remote control or operator’s station is active.

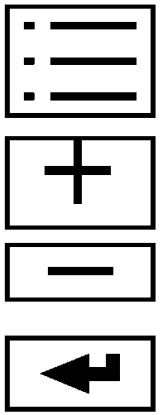
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(6) *Menu key*
Press . . . . . **access menu**
Also, press to back out of a selection without saving.

(7) *Increase key*
Press . . . . . **scroll up through screens or to increase values**

(8) *Decrease key*
Press . . . . . **scroll down through screens or to decrease values**

(9) *Enter key*
Press . . . . . **select screen items or to save values**

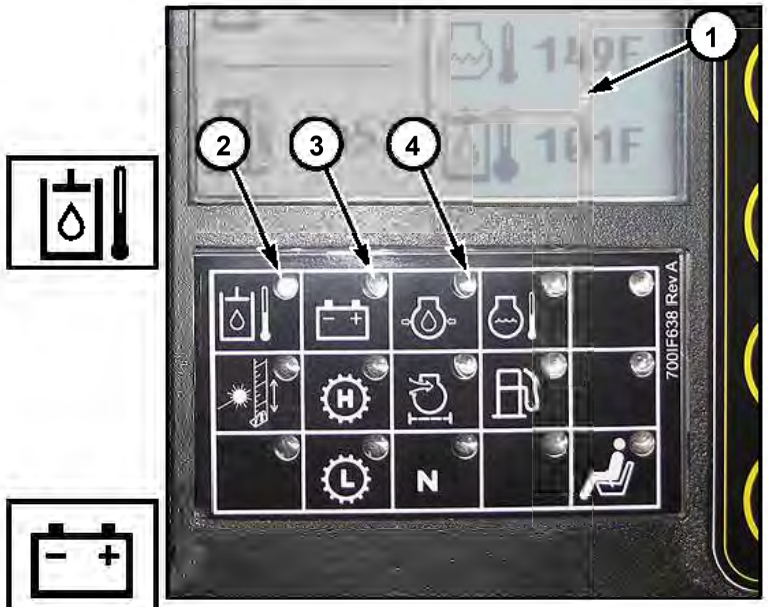




Keys 5, 6, 7, 8, and 9 are always available regardless of whether remote control or operator's station is active.

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Machine Monitor Lights



(1) Display

(2) Hydraulic fluid high temperature indicator (red)
Red light comes on when hydraulic oil temperature reaches 190°F (88°C) and indicates that oil temperature is getting too high. Follow *Shutdown Procedure,* page *23-1.* Check fan belt for wear. Make sure cooler is not blocked and intake screens are clean.

If temperature exceeds 200°F (93°C) for 30 seconds, a hydraulic temperature high fault will be shown on display and an engine shutdown will occur.

(3) Alternator indicator (red)
Indicates (depending on engine option) alternator is not charging correctly, or ignition switch is on and engine is not running.

Indicates low or high voltage while engine is running.

(4) Low engine oil pressure indicator light (red)
A light comes on:

Deutz: When oil pressure falls below an acceptable minimum, with the engine running and the condition lasts for more than 12 seconds, the engine will shut down. Engine restart and run is allowed for up to 10 seconds to move machine if needed. This restart may be done multiple times.

Yanmar: When oil pressure is too low. If light comes on while engine is running, or if light does not shut off within 15 seconds after starting engine, follow *Shutdown Procedure* and correct the issue. Refer to *page 23-1.* After 15 seconds, the engine will shut down automatically if oil pressure indicator light is on for a continuous five seconds.

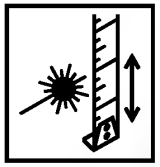
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(5) Engine coolant temperature indicator (red)
Light comes on when temperature reaches 230°F (110°C).

If temperature continues to rise, the engine will derate to avoid excessive temperature. If coolant exceeds 246°F (119°C) for 10 seconds, the engine will shut down. Engine restart and run is allowed for up to 10 seconds to move machine if needed. This restart may be done multiple times.



(6) Laser elevation (option) (green)
Indicates use of laser elevation has been enabled.



(7) Air restriction indicator (amber)
Indicates air filter is dirty.



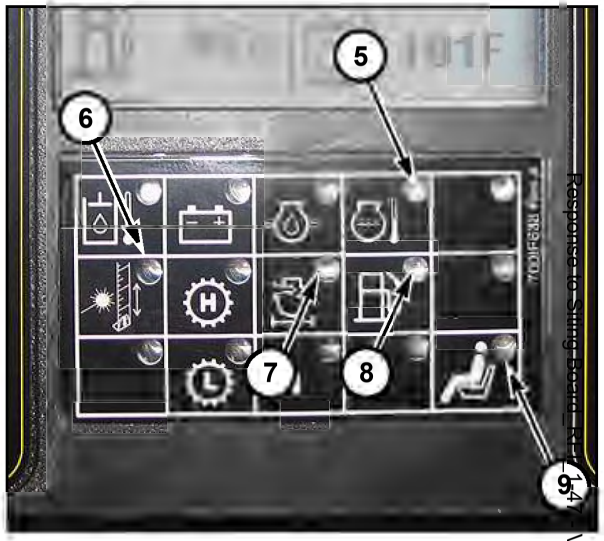
(8) Low fuel indicator (amber)
Indicates less than 10% of fuel capacity remains.
Display also shows fuel remaining, in amount as a percent of capacity.



(9) Operator presence system engaged (green)
Light comes on when operator is in seat and key is on.

Light will flash for three seconds after operator leaves seat and then turns off. All engaged functions will stop.





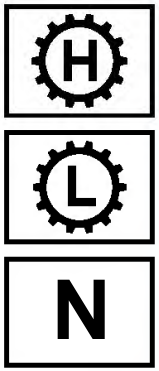
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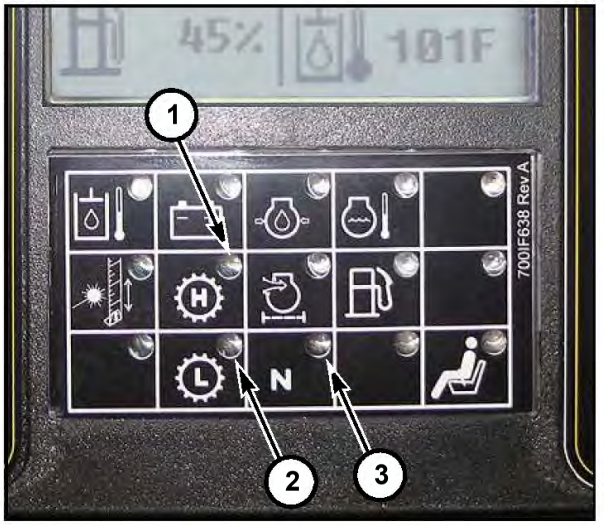
Ground Drive Indicator Lights

(1) Ground drive high (green)

(2) Ground drive low (green)

(3) Neutral (green)
Indicates joysticks and ground drive are in neutral. If any control is out of neutral, light goes out.
Hammer float switch does not turn light off.





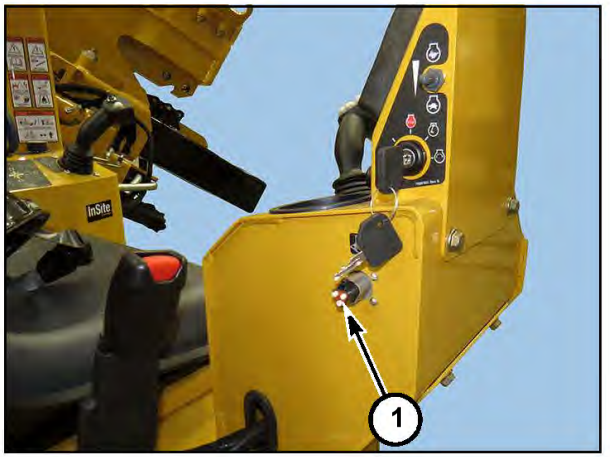
Park Brake

Park brake automatically comes on if ground drive is in neutral or if engine is off.

Diagnostic Port

Plug in laptop at port **(1)** to diagnose error messages.





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Operator's Station Controls

(1) *Operator presence switch*

(2) *Seat slide lever*

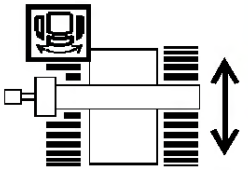
(3) Electrical accessory outlets

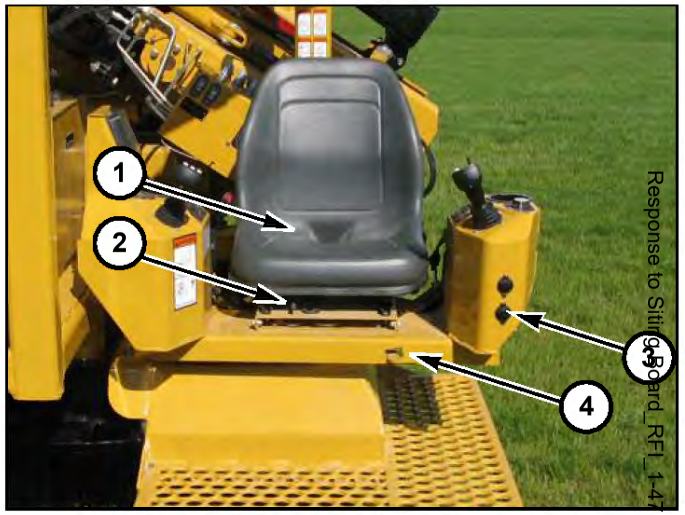
(4) *Operator's station pivot lever*

Transport Mode Position

When sitting in seat, use lever **(4)** to rotate seat to the right.

Transport mode position is used for moving machine when it is not in work mode. Hydraulic hammer, hammer float, auto plumb, auto home, and auto target functions are locked out in this position. All *right joystick* functions are locked out when ground drive is engaged. Backup alarm is active.





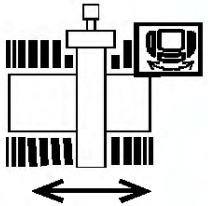
Transport Mode Position

Work Mode Position

When sitting in seat, use lever **(4)** to rotate seat to the left.

Work mode position is used for operating the hammer. All machine functions are available in work position.

Backup alarm is not active.

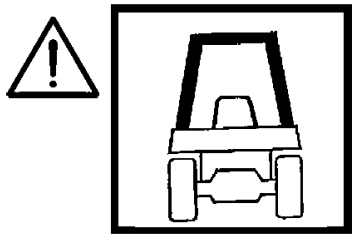




Work Mode Position

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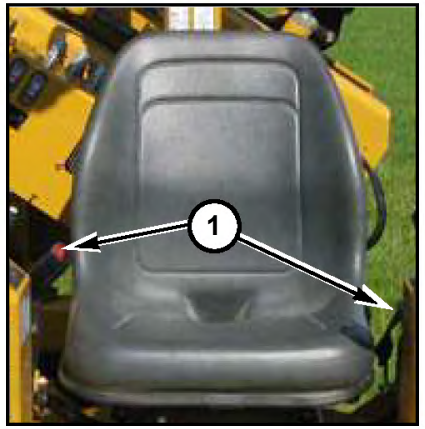
Seat Belt



WARNING: The rollover protection structure (ROPS) is intended to protect the tractor operator in the event of a rollover. In order for you to be protected by the ROPS, you must wear seat belts. Follow instructions below relating to ROPS safety precautions.

Seat belt **(1)** must be worn at all times while operating the machine from the seated controls. To fasten seat belt, extend belt and snap it into belt clasp. Ensure all slack is out of the belt. Seat belt must be snug but not tight.

To unfasten seat belt, press red release button on belt clasp.



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Operator Presence Switch

The operator presence system uses a switch in the seat **(1)** to detect the presence of an operator. The operator must be seated for the functions to operate.

If the operator leaves the seat while a function is operating, the function will stop within three seconds. All controls must be returned to neutral before any function can be resumed.

The operator presence system is intended for your safety and must be maintained in good functional condition. Contact your Vermeer dealer if it does not function properly.



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Ground Drive Controls (Left Joystick)

Machine moves in direction of left joystick movement.

Work Mode

Shown on machine in yellow.

When sitting in seat, use *operator's station pivot lever* to rotate seat to the left.

(1) Move joystick ahead and left

(2) Move joystick straight ahead from neutral to counter-rotate counterclockwise

(3) Move joystick ahead and right

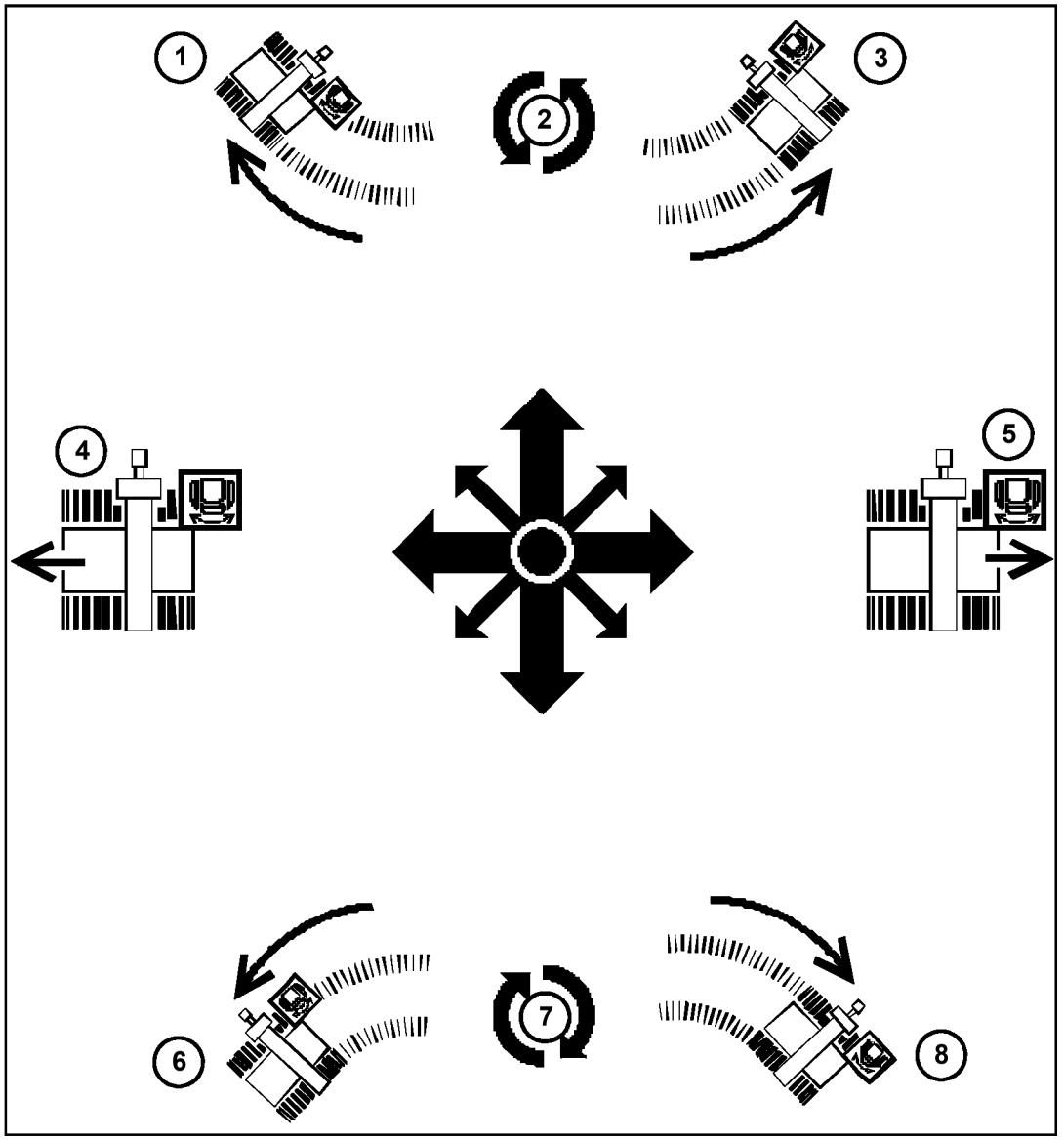
(4) Move joystick left

(5) Move joystick right

(6) Move joystick back and left

(7) Move joystick straight back from neutral to counter-rotate clockwise

(8) Move joystick back and right



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Transport Mode

Shown on machine in white.

When sitting in seat, use *operator's station pivot lever* to rotate seat to the right.

(1) Move joystick ahead and left

(2) Move joystick ahead

(3) Move joystick ahead and right

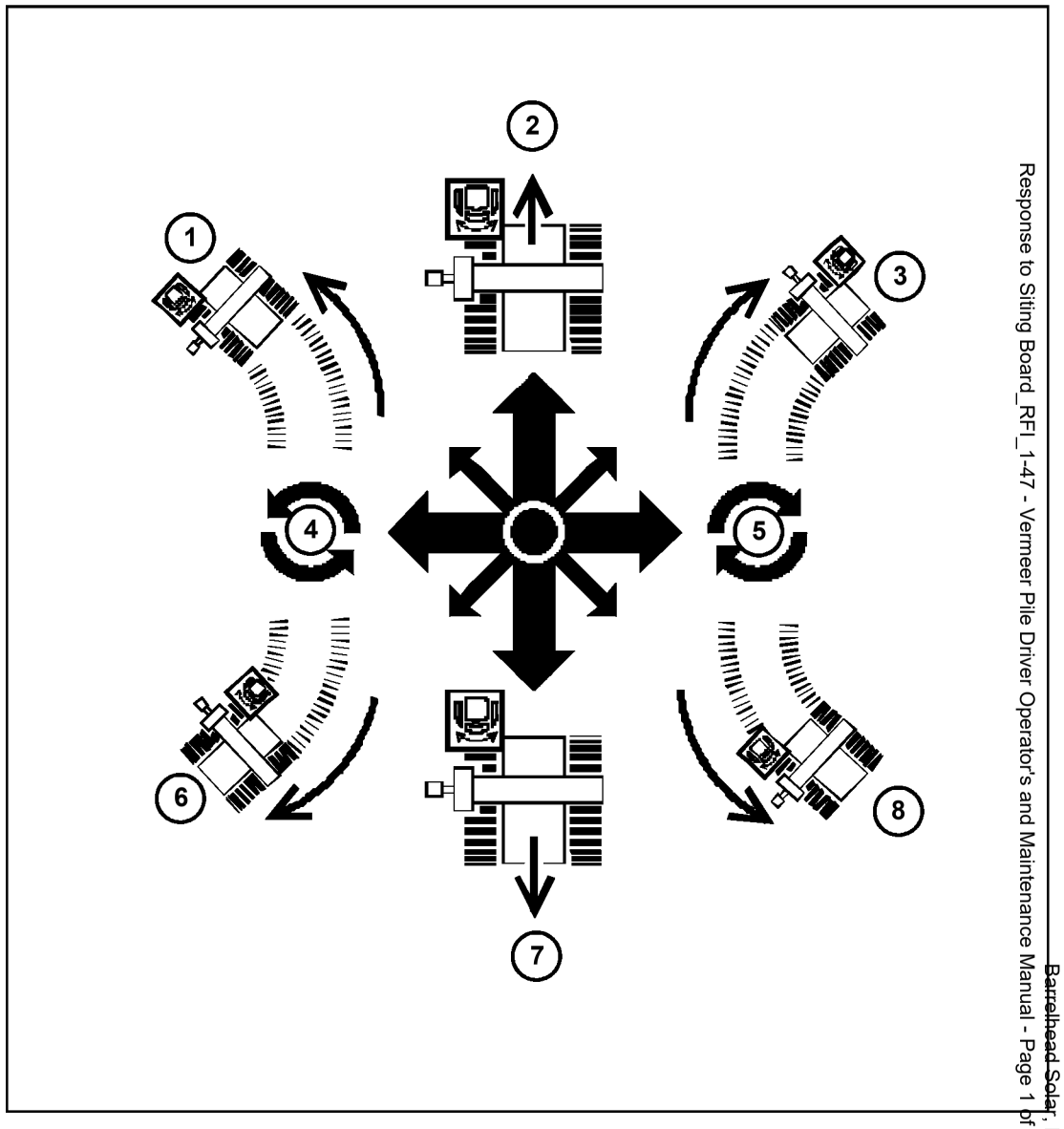
(4) Move joystick straight left from neutral to counter-rotate counterclockwise

(5) Move joystick straight right from neutral to counter-rotate clockwise

(6) Move joystick back and left

(7) Move joystick back

(8) Move joystick back and right



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Right Joystick Controls

(1) *Hammer on/off button*
Press and release. . . . . **turn on hammer**
Press again. . . . . **turn off hammer**

This control is only active in work mode (seat rotated to the left).

(2) *Hammer – momentary button*
Press and hold . . . . . **hammer functions only while holding button**

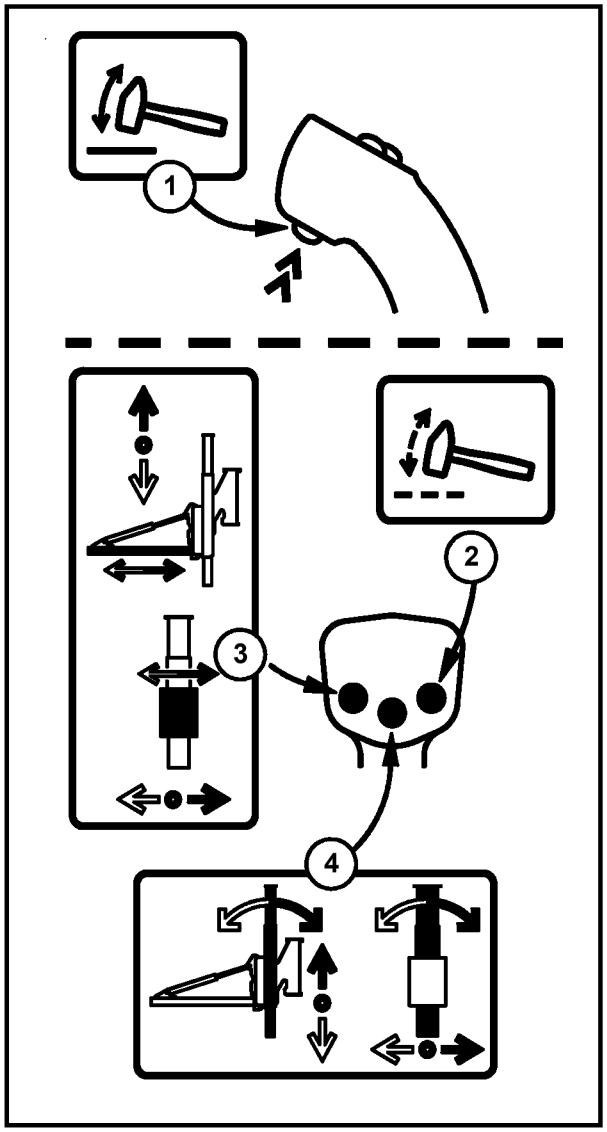
This control is only active in Work mode.

(3) *Mast slide button*
Press and hold
While pushing joystick forward . . . . . **mast slides away from machine**
While pulling joystick back . . . . . **mast slides toward machine**

While pushing joystick left. . . . . **mast slides toward rear of machine**
While pushing joystick right . . . . . **mast slides toward front of machine**

(4) *Mast tilt button*
Press and hold
While pushing joystick forward . . . . . **mast tilts away from machine**
While pulling joystick back . . . . . **mast tilts toward machine**

While pushing joystick left. . . . . **mast tilts toward rear of machine**
While pushing joystick right . . . . . **mast tilts toward front of machine**

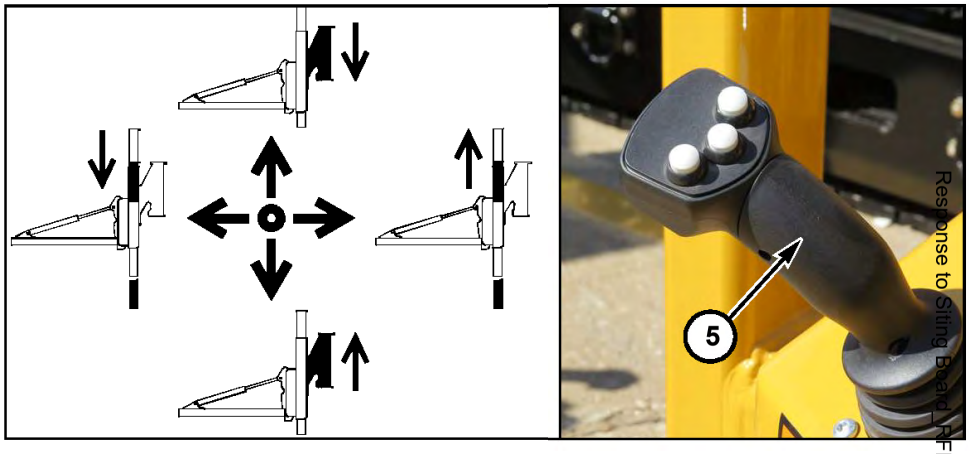


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(5) *Mast and hammer raise and lower*

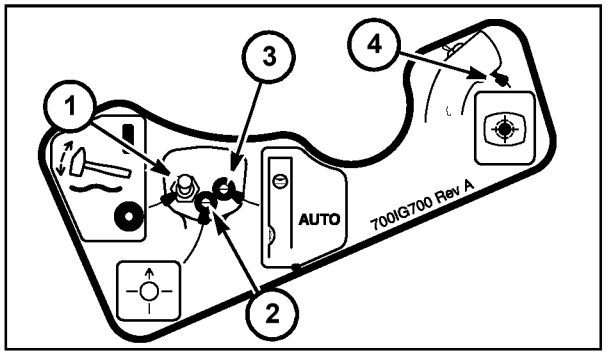
Push joystick forward . . . . . **lower hammer**
Pull joystick rearward . . . . . **raise hammer**
If hammer is raised above proximity switch zone, ground speed is limited. Refer to “Ground speed range,” *page 20-24.*

Joystick left . . . . . **lower mast**
Joystick right . . . . . **raise mast**



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Left Joystick



(1) *Hammer float switch*

Push up . . . . . **hammer float on**

Push down . . . . . **hammer float off**

(2) *Auto home mast slide switch* (enhanced cylinder option)

Slides mast to a preset, user adjusted, position within the horizontal slide range (both X/Y axes).

(3) *Auto plumb switch*

Auto plumb automatically moves mast to vertical position.

Press . . . . . **auto plumb activated**

Press again . . . . . **auto plumb canceled**

Auto plumb does not function if:

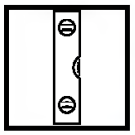
- Operator's station is not in Work mode
- Mast is tilted 5° or more away from machine, or 11° or more toward machine (with hammer in low position)
- Mast is tilted 5° or more in any direction from plumb (with hammer in high position)
- Hammer is engaged
- Mast functions are engaged
- Ground drive is engaged

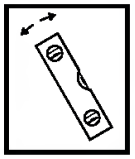
(4) *GPS auto target switch* (if equipped with compatible third-party GPS system)

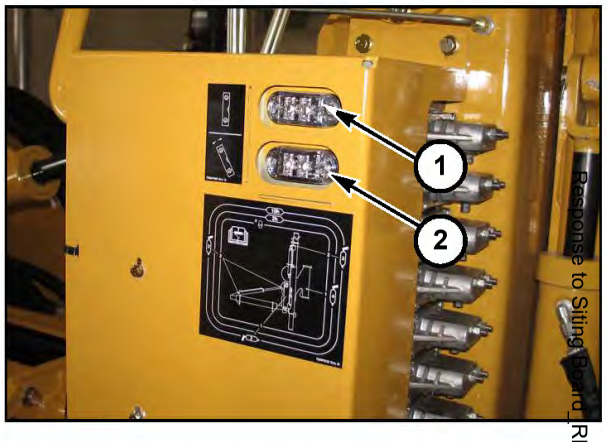
Slides mast to reach GPS target.

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Mast Plumb Lights







(1) Green light on . . . . . .mast within plumb tolerance range

(2) Amber light flashing . . . . . .auto plumb cycle active

If amber light and green light are on at the same time, mast is within plumb tolerance but green light turned off at least once since completion of auto plumb.

Hammer Speed Dial









(1) Hammer Speed (blows per minute)



Left/counterclockwise . . . . . **decrease hammer speed**

Center . . . . . **detent, hammer speed at 75%**

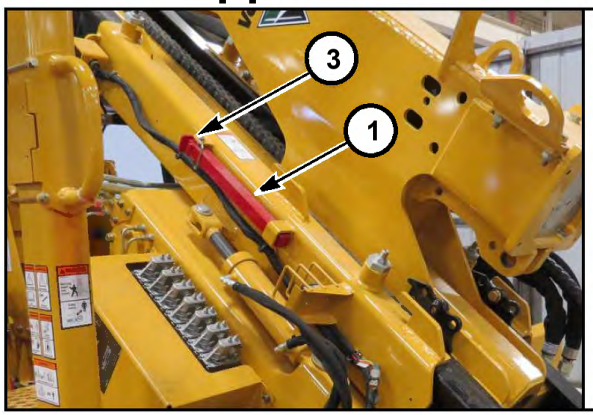


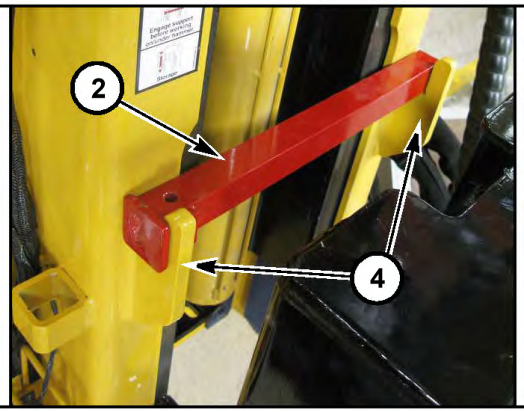
Right/clockwise . . . . . **increase hammer speed**

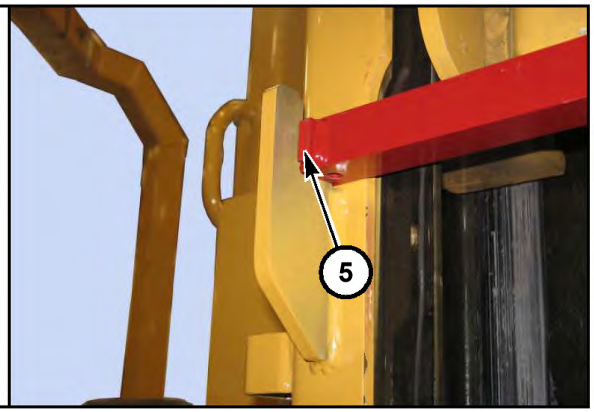
NOTICE: Never operate hammer without hammer being in contact with the pile.

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Hammer Support Bar







(1) Storage position

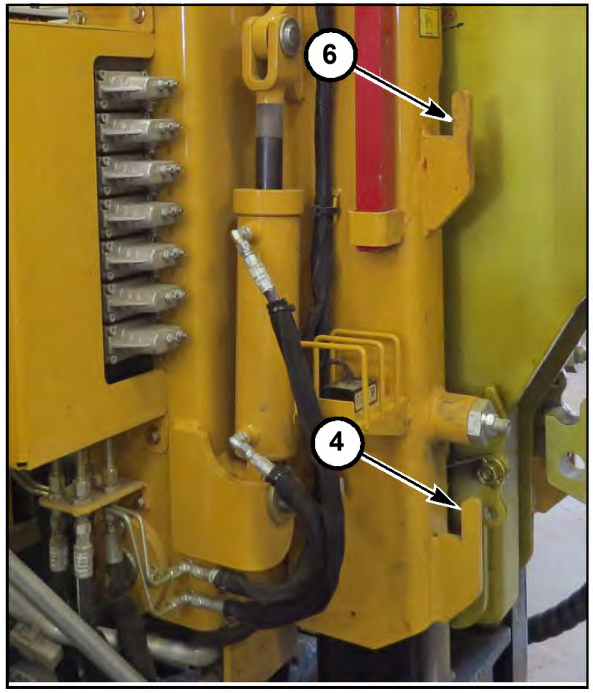
(2) Service position

Step 1: Remove snap pin **(3)** and slide support bar out of storage position.

Step 2: Install bar in lower brackets **(4)**, with stop **(5)** on support bar, positioned to prevent bar from sliding.

Step 3: Lower hammer to support bar.

A second set of brackets **(6)** is provided for some service procedures.



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Laser Receiver (Option)

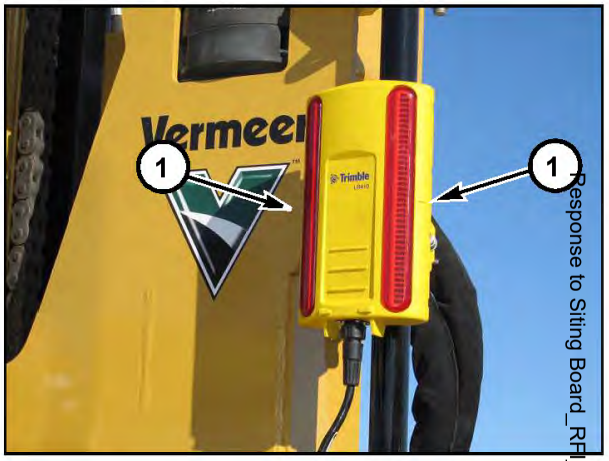
Laser receiver is mounted on hammer carriage.

Hammer slows as it approaches laser-set height.

Hammer stops when it reaches laser-set height.

Arrows **(1)** on receiver are set points.

Press *measure mode key* to select laser elevation mode. Refer to “Measure mode key,” *page 20-4.*



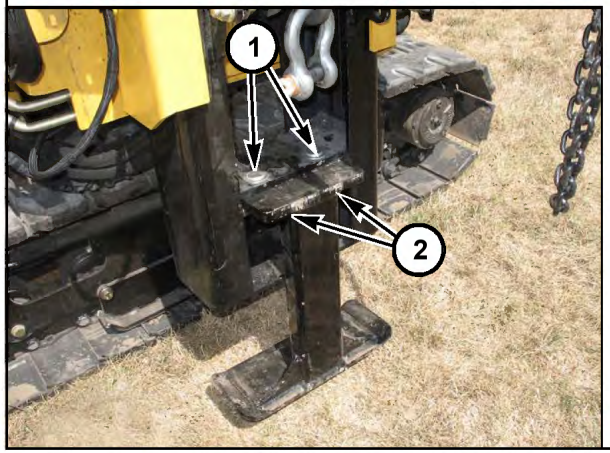
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Stabilizer Foot

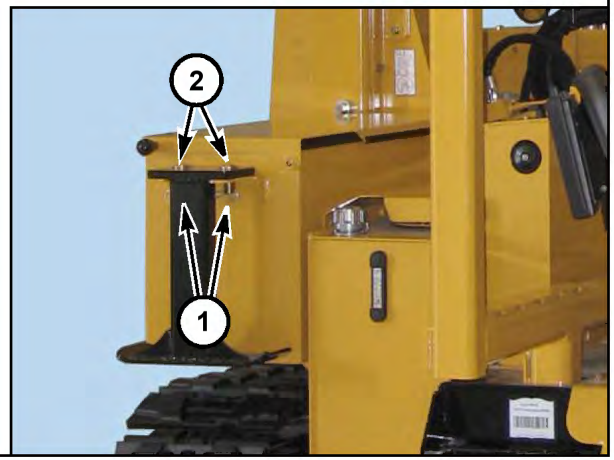
The stabilizer foot is used for pile extraction.

Secure in work position or storage position with pins **(1)** and hairpins **(2)**.

Stabilizer foot in work position



Stabilizer foot in storage position

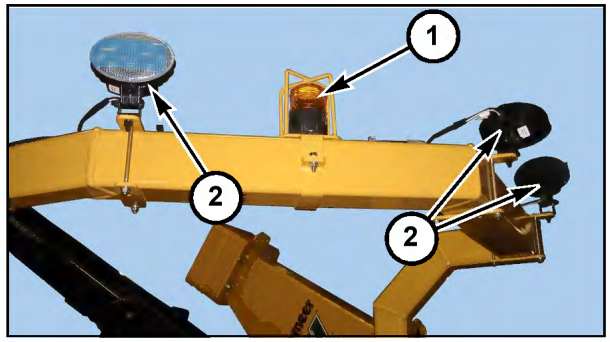


Lights

(1) Beacon for optional remote control

Beacon turns on when remote is enabled.

(2) Work lights



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Access Panels

Access – Engine

At rear of machine, release latches and open door **(1)** to access:

- Engine oil: fill, filter, and dipstick
- Fuel/Water separator filter (Deutz engine only)

Access – Coolant

At rear of machine, unscrew knob to slide plate **(2)** to the side and access radiator cap.

Access – Hydraulic Pump

At rear of machine, remove bolts and shield **(3)** to access hydraulic pump stack.

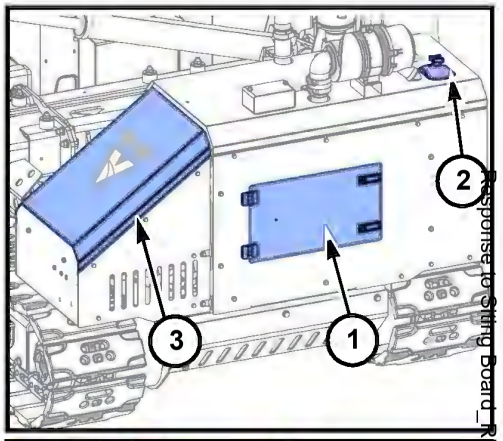
Access – Battery/Battery Disconnect Switch

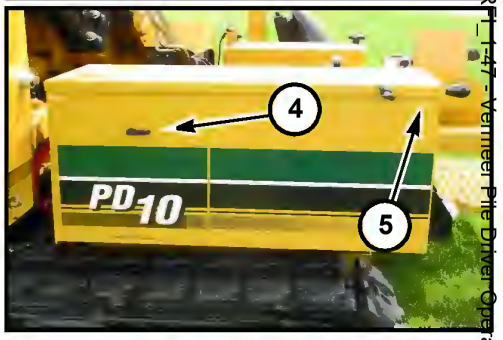
On right side, access for the following:

- Open compartment **(4)** to access battery.
- Open toolbox **(5)** to access *battery disconnect switch* **(6)**.

Access – Storage For Optional Remote Control

- The storage location for an optional remote control **(7)** is inside the toolbox **(5)**.



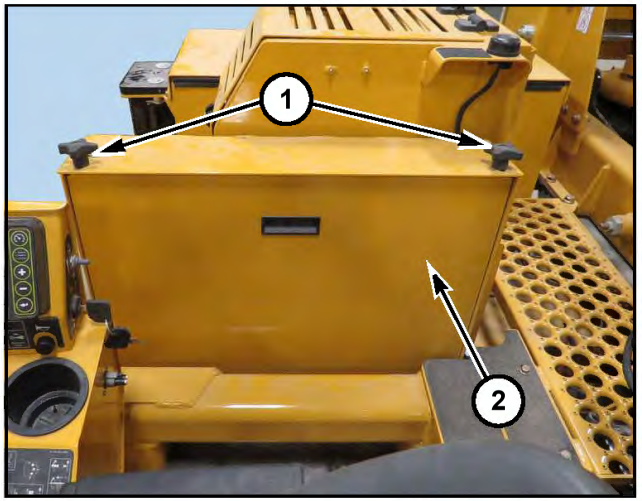




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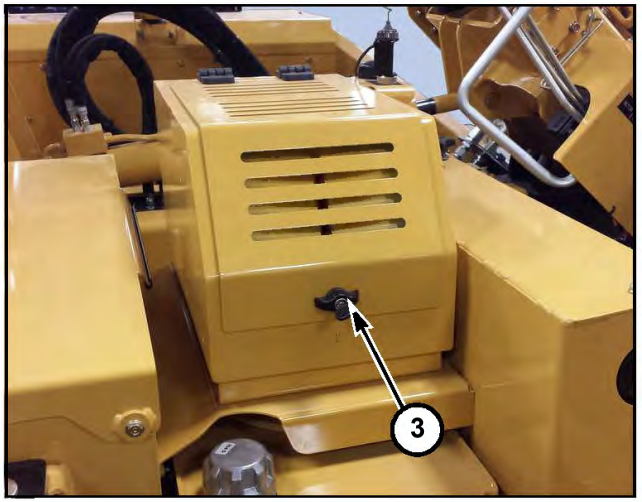
Access – Fuses/Relays

At front of machine by operator's station, unscrew knobs **(1)** and remove shield **(2)** to access fuse panel and relays.



Access – Telematics, Compatible Third-party GPS System

Open compartment **(3)** to access telematics hardware and connection for compatible third-party GPS system.



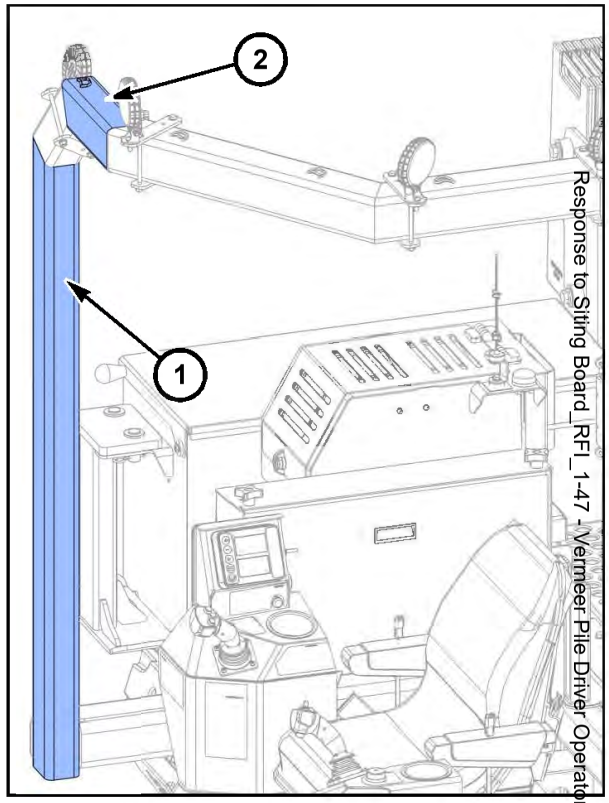
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Fire Extinguisher Mounting Location

A fire extinguisher (not supplied with machine) can be mounted on right side post of ROPS **(1)**. Clamp the fire extinguisher bracket to the ROPS bar. Do not drill or weld on the ROPS bar. Unauthorized modification of the ROPS could weaken the structure and reduce protection. Refer to “Rollover Protective Structure (ROPS),” *page 30-3.*

Warning Beacon Mounting Location

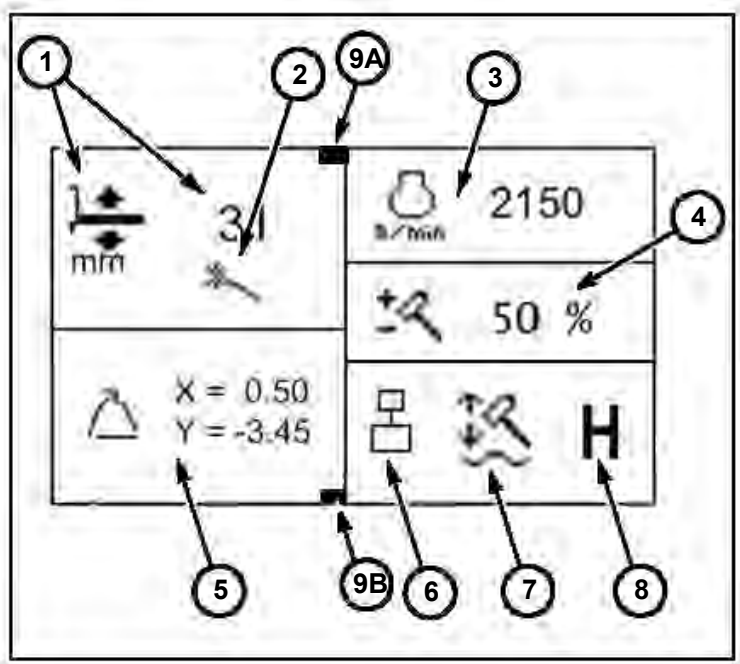
A warning beacon can be mounted on the overhead bar of the ROPS **(2)**. Clamp the warning beacon to the ROPS bar. Do not drill or weld on the ROPS bar. Unauthorized modification of the ROPS could weaken the structure and reduce protection. Refer to “Rollover Protective Structure (ROPS),” *page 30-3.*



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Controller Screens

Main Screen



(1) Laser elevation (if equipped)
Elevation from target in millimeters

(2) Measure mode selection
Refer to “Measure Mode Selections,” *page 20-25.*

(3) Engine speed
rpm

(4) Hammer speed flow output range
50 – 100%

(5) Mast frame angle
Angle away from vertical axis
X-axis is parallel to direction of travel.
Y-axis is perpendicular to direction of travel.
When auto plumb is active, the letter “A” replaces the icon.

(6) Remote control
On: remote enabled
Flashing: remote disabled or off
Off: operator in seat or remote receiver not installed

(7) Hammer float: float on

(8) Ground speed range
H: high speed range
L: low speed range
Only limited low speed range is allowed when hammer is in high position.
High and low speed ranges are allowed when hammer is in low position.

(9) Hammer high/low status
Position of black rectangle indicates hammer is in either high position **(9A)** or low position **(9B)**.

Measure Mode Selections

Available modes depending on machine setup:

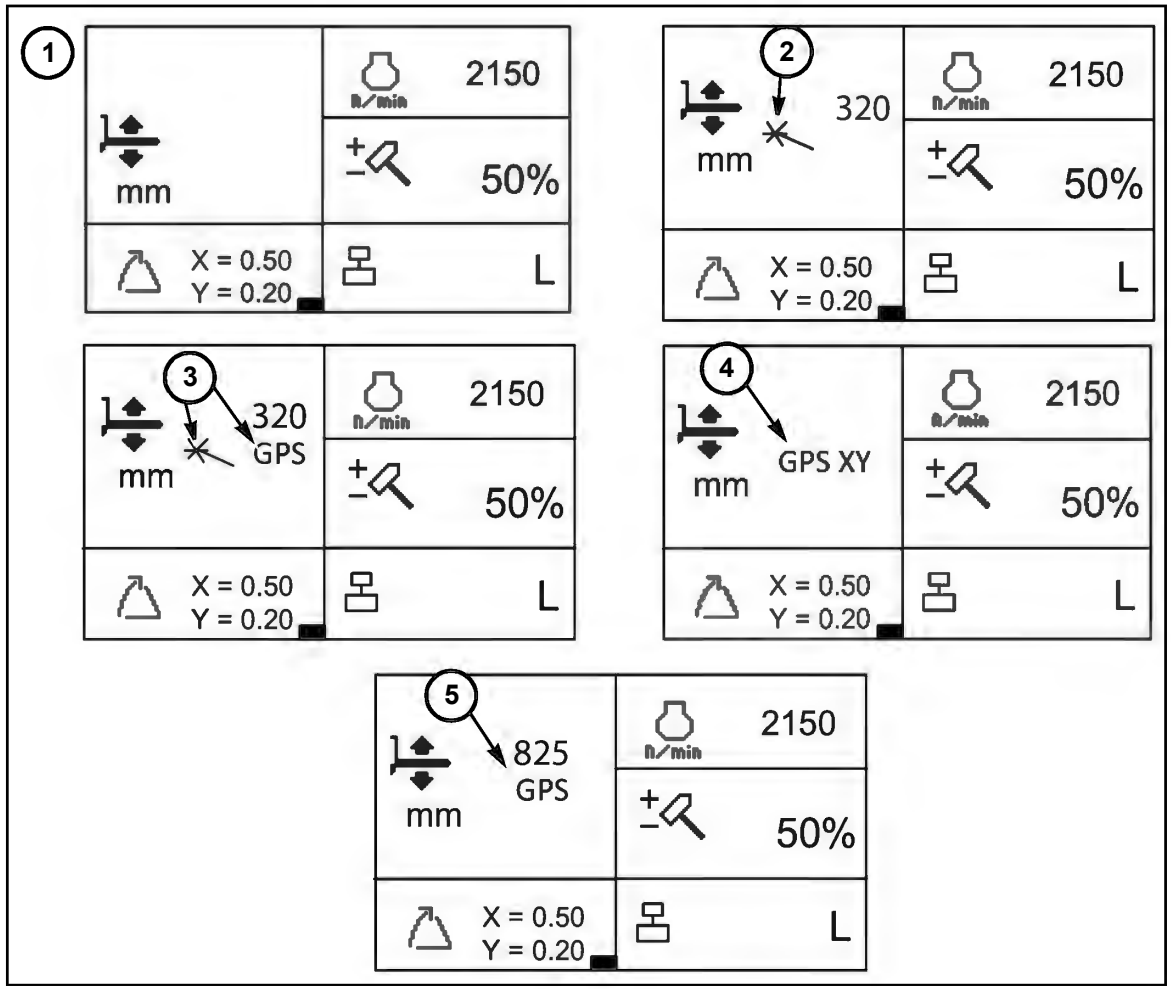
(1) Manual:
Manual positioning and elevation are enabled.

(2) Laser elevation:
Laser elevation is enabled and requires optional laser receiver. Manuals positioning enabled.

(3) Laser elevation with GPS X/Y:
Laser elevation is enabled and requires optional laser receiver. GPS positioning is enabled and requires compatible third-party GPS system.

(4) GPS X/Y:
GPS positioning is enabled and requires compatible third-party GPS system.

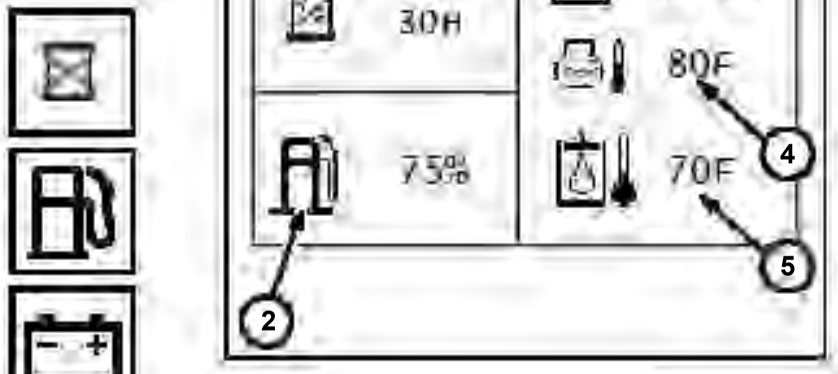
(5) GPS X/Y/Z:
GPS positioning and elevation is enabled, and requires compatible third-party GPS system.



Engine Screen

The engine screen appears when *engine key* on DP10 controller is pressed.

Press *engine key* again to return to main screen.





(1) Engine hours

(2) Fuel level

(3) System voltage

(4) Coolant temperature

(5) Hydraulic temperature

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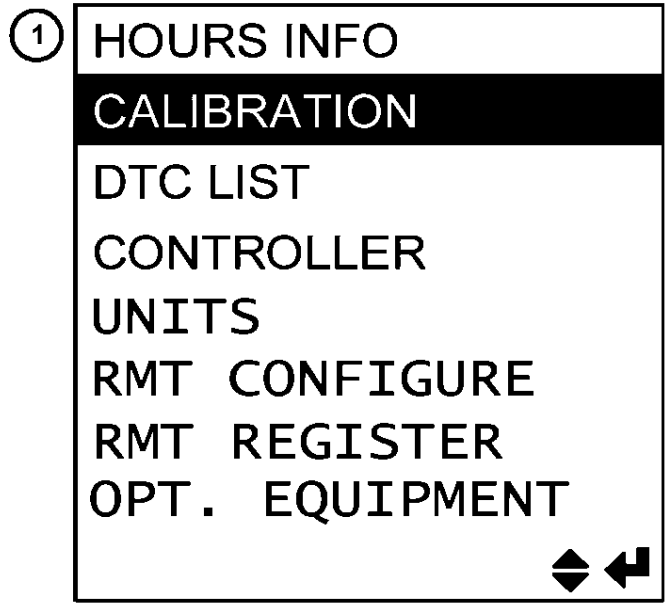
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Main Menu Screen

The main menu screen **(1)** appears when *menu key* on DP10 controller is pressed.

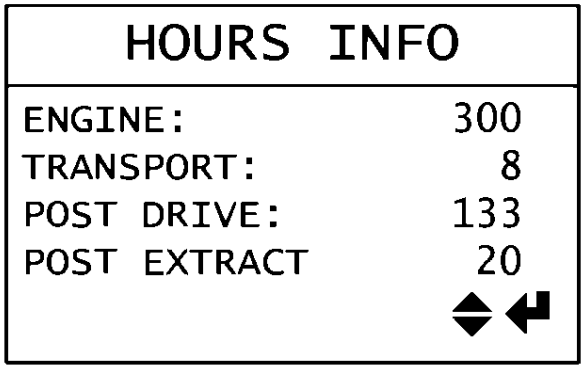
Press *increase/decrease keys* to highlight desired menu item. Press *enter key* to select highlighted item.

Press *menu key* to return to main screen.



Hours Info Screen

Screen displays engine hours, transport hours, post driving hours, and post extraction hours.



Calibration Screen

Press *increase/decrease keys* to highlight desired calibration item. Press *enter key* to select highlighted item.

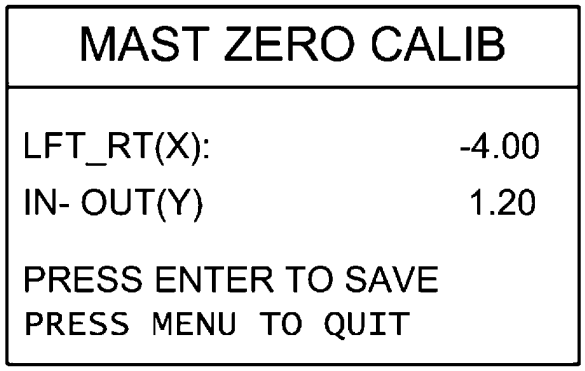


Mast Zero Screen

Use secondary measuring device, such as a bubble level, to verify mast is vertical. Then press *enter key* to set mast angle to zero.

X-axis is parallel to direction of travel.

Y-axis is perpendicular to direction of travel.



Ground Drive Screens

Use these screens to adjust steering offset.

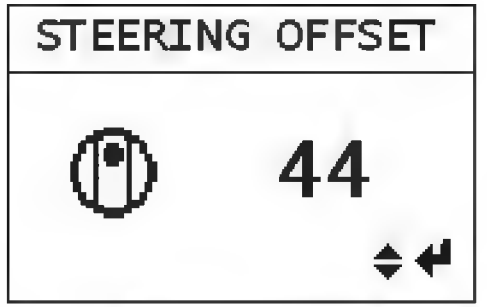
If the machine tracks more in one direction because of the position of the mast and hammer or ground conditions, changing the steering offset value guides the tracking to the other direction.

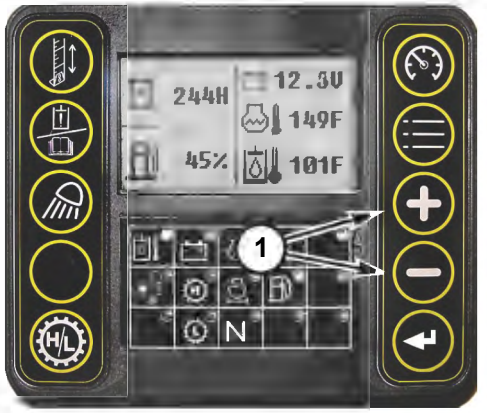
Step 1: Press *increase/decrease keys* to highlight desired item.
For forward travel, choose “STEERING FWD.”
For rearward travel, choose “STEERING REV.”

Step 2: Press *enter key* to select option.

Step 3: Press *increase/decrease keys* **(1)** to adjust bias. Adjustable range is -100 to +100.

- A lower steering offset value biases machine steering toward the left.
- A higher steering offset value biases machine steering toward the right.





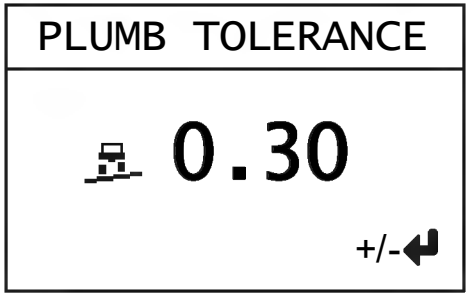
Plumb Tolerance Screen

Plumb tolerance allows the operator to choose the precision angle required to operate the auto plumb.

A value of 0.30 means ±0.3° from 0° will be considered plumb.

Tolerance is ±5.0° in 0.05° increments.

Press +/- *keys* to increase/decrease value.



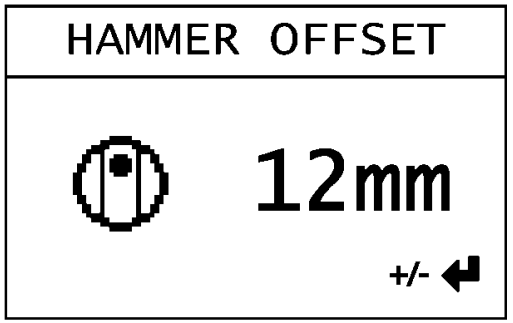
Hammer Offset Screen

Use this screen to adjust hammer shutoff when driving to either a laser receiver target or a GPS elevation target. This adjustment helps to compensate for varying soil density, and decreases the chance of over driving posts in softer soil conditions.

A value of 12 mm means that hammer is shut off 12 mm above target elevation. Adjust as needed for soil conditions. Regardless of offset value, controller screen will show actual distance to target elevation.

Offset is adjustable from 0 – 1 000 mm.

Press +/- *keys* to increase/decrease value.



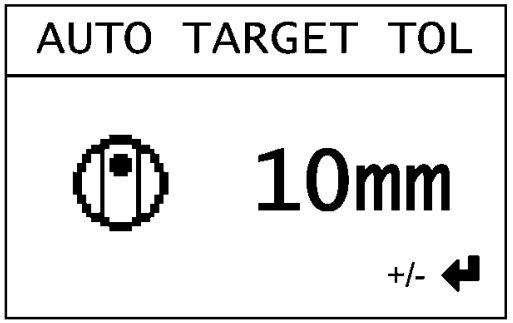
Auto Target Tolerance Screen

Auto target function uses a tolerance zone around target pile location to position mast using compatible third-party GPS system.

A lower value results in a smaller tolerance zone.

Tolerance is adjustable from 5 – 50 mm.

Press +/- *keys* to increase/decrease value.

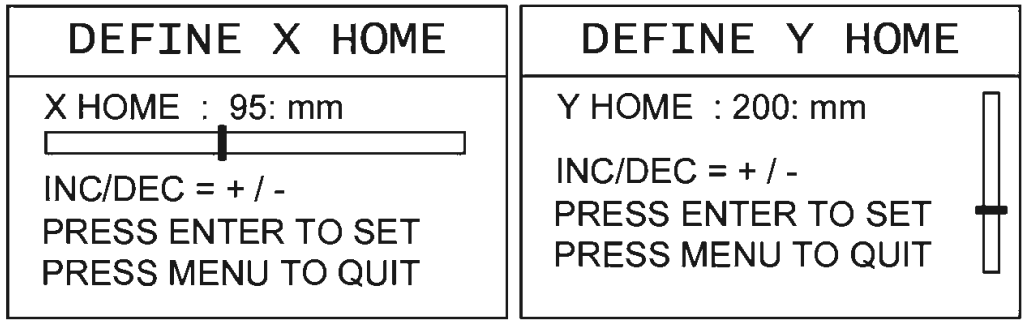


Define X Home and Y Home Position Screens

These screens allow the “Return to Home” position to be defined for X and Y when used in conjunction with the slide position sensors.

Press +/- *keys* to increase/decrease value.

Press *enter key* to set value.

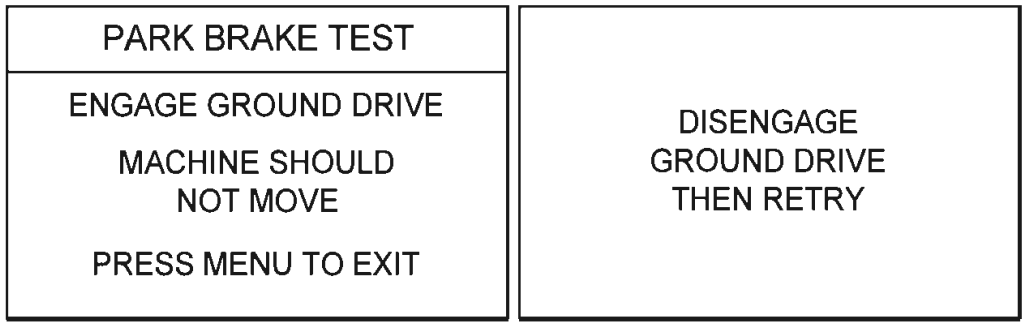


Park Brake Test Screen

Select this screen to perform a park brake test.

Engage ground drive after selecting brake test. Machine should not move during test. Contact local Vermeer dealer if machine moves during test.

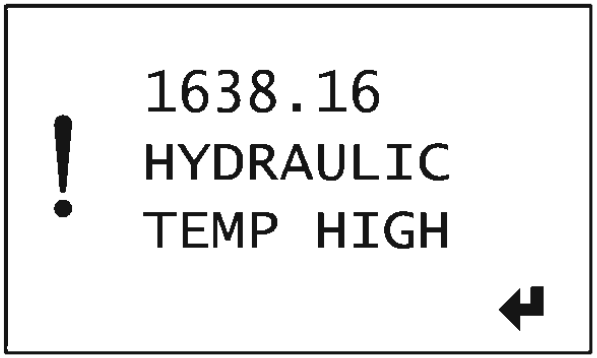
“DISENGAGE GROUND DRIVE, THEN RETRY” will be shown on display if ground drive is active before selecting test. Refer to “Park Brake – Check,” *page 60-26.*



DTC (Diagnostic Trouble Code) List Screen

When a fault becomes active, its code number and text is shown on the display. Faults remain on the display until they become inactive, are cleared, or until hidden by a higher priority fault.

Press *enter key* to clear it from the display. After clearing, fault is only shown if it becomes active again.



Fault Storage Screen

Up to 10 faults are stored, with additional faults overwriting the oldest entry. View stored faults by selecting DTC List on the main menu display.

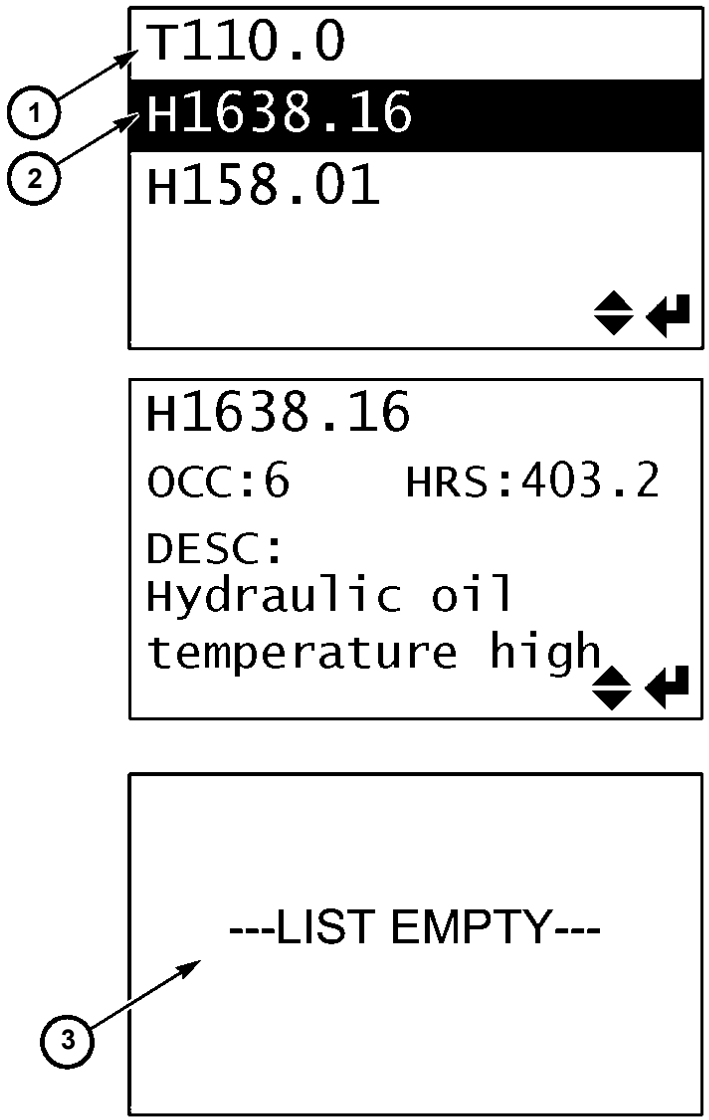
The fault list display shows active and previously active faults.

- Currently active fault: T before fault number **(1)**
- Previously active fault: H before fault number **(2)**

Use *+/- keys* to navigate through fault list.

Press *enter key* to select a fault and see more information. Descriptive text, total number of occurrences since last cleared and an engine hour time-stamp of the last occurrence is displayed.

“LIST EMPTY” **(3)** appears on the screen when no faults are stored.



Valve Reset Key

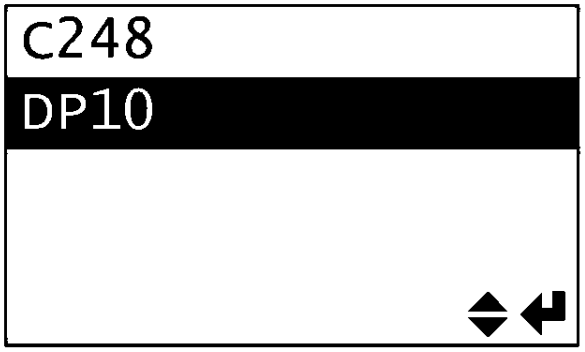
If mast or hammer fail to respond to joystick commands, a fault message will be shown on screen. Check behind valve banks for a red light. If red light is on, press *valve reset key* **(1)**.

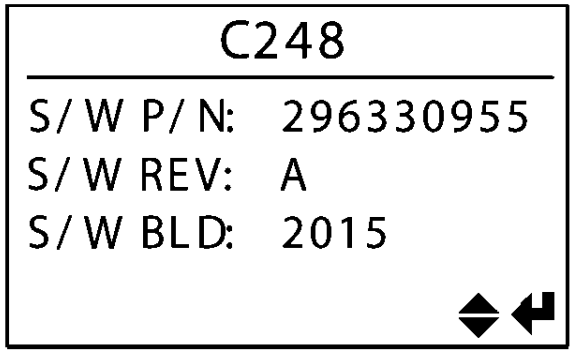
If issue continues after pressing key, contact your Vermeer dealer.

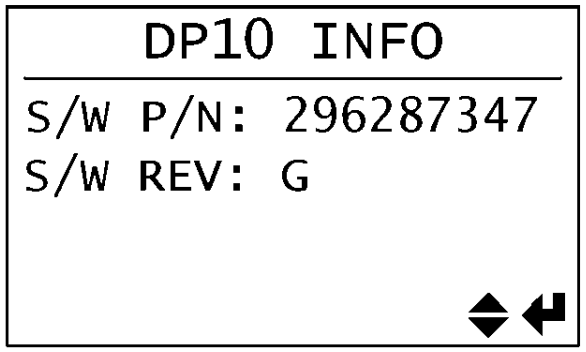


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Controller Screen (Information Only)







Use *+/- keys* to highlight a controller.

Press *enter key* to select controller and view its software information.

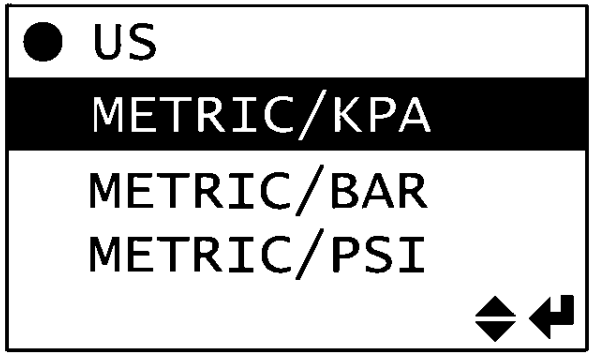
Information such as software part number, revision, and build is shown on screen depending on which controller is selected.

Units Selection Screen

Switch between U.S. units, metric units with kPa, metric units with bar or metric units with psi.

Use *+/- keys* to highlight a unit of measure.

Press *enter key* to select.

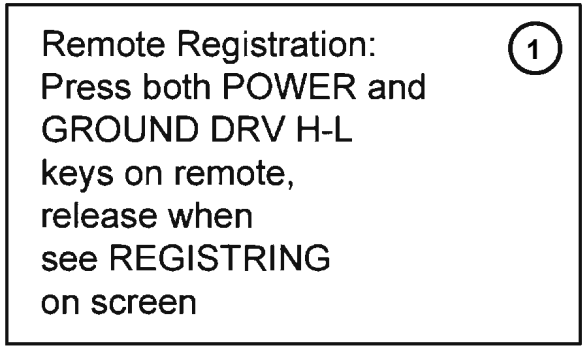


Remote Register Screen

Use this screen to register remote control with remote receiver on machine.

Follow instructions as shown on remote control screen **(1)**.

When registration is completed, “REGISTERED” is shown on remote control screen.

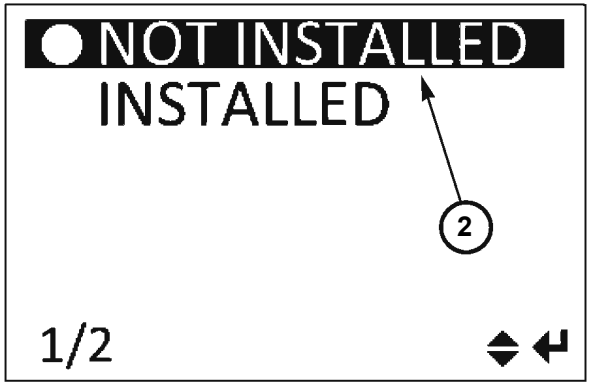


Remote Configure Screen

Remote control receiver is automatically detected when installed on machine. Use this screen if remote control receiver is removed.

Use *+/- keys* to highlight “Not Installed” **(2)**.

Press *enter key* to select.



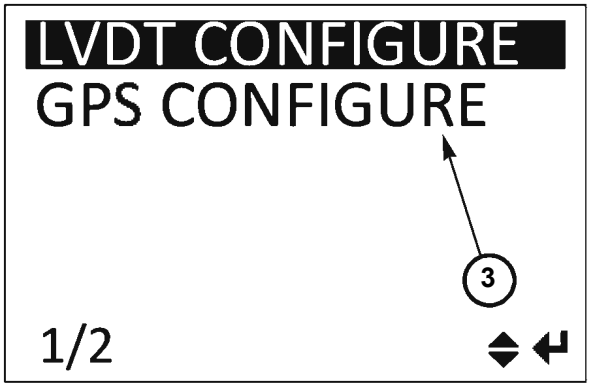
Optional Equipment Screen

LVDT sensors (used to monitor slide position) or compatible third-party GPS equipment is automatically detected when installed on machine. Use this screen if optional equipment is removed.

Use *+/- keys* to highlight optional equipment **(3)** that was removed.

Press *enter key* to select.

Use *+/- keys* to highlight “Not Installed” **(2)** and press *enter key* to select.



Inclinometer Offline

When the inclinometer is offline (failed or disconnected), the fault message, “INCLINE SNSR COMM FAULT” will display. The machine functions will be affected and include one or more of the following:

- Engine speed will be limited to a maximum of 2,300 rpm (Deutz) or 2,500 rpm (Yanmar).
- Mast tilt is disabled with hammer in a high state.
- Mast tilt speed is limited with hammer in low state.
- Hammer raise/lower speed is limited.
- Mast raise/lower speed is limited.
- Ground drive speed is limited to low range.
- Auto plumb is disabled.
- Auto home is disabled.
- Auto target is disabled.
- Mast angle value is displayed as dashes.

Press enter to clear the fault message.

One of the following advisory messages will display when actuating a function that is not allowed:

- Inclinometer Offline
- Functions are Limited
- Read Operator’s Manual

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To position the machine for tracking:

Step 1: Lower hammer

Step 2: Lower mast

Step 3: Tilt mast to cradle

Before tracking, refer to “Transporting the Machine,” *page 30-1*.

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Section 21: Optional Remote Control

The remote control **(A)** is stored inside the toolbox. Refer to “Access – Storage For Optional Remote Control,” *page 20-21.*

Controls

(1) *Plus/Up key*

Increases value or scrolls up.
Also, the first key in remote control enable sequence

(2) *Minus/Down key*

Decreases value or scrolls down.
Also, the second key in remote control enable sequence

(3) *Enter key*

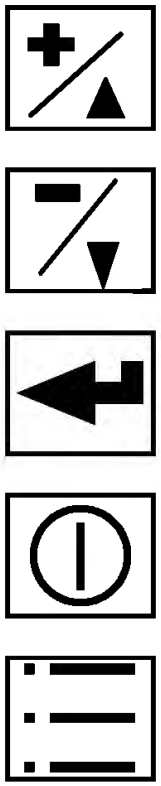
Selects a value or a selected menu item.
Also, the third key in remote control enable sequence

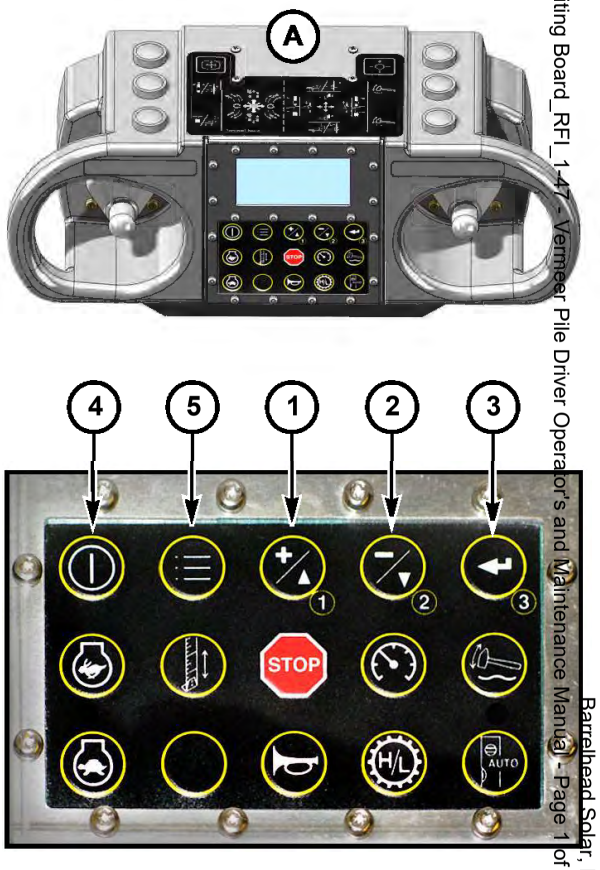
(4) *Power key*

Press to turn remote control on/off

(5) *Menu key*

Press to access menu.
Also, used to back out of a selection without saving





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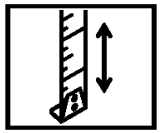
(6) *Throttle increase key*

Press . . . . . **increases rpm**



(7) *Measure mode key*

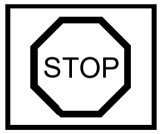
Press . . . . . **select desired measure mode**



(8) *Engine stop key*

Press . . . . . **stop engine**

This key stops engine if remote control is connected, regardless of whether the remote is enabled or disabled.



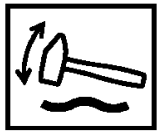
(9) *Engine screen key*

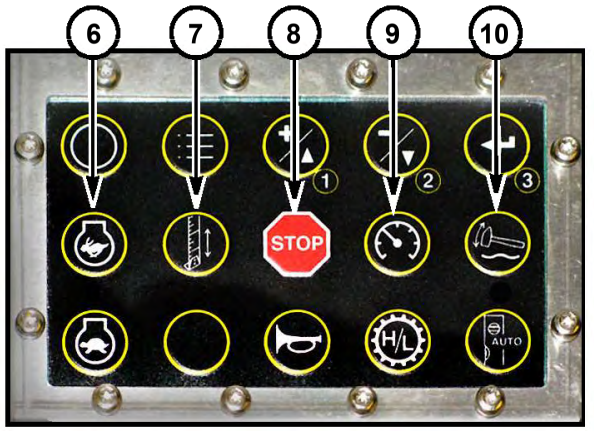
Shows engine screen. Refer to *page 20-26.*



(10) *Hammer float key*

Press . . . . . **hammer float on**
Press again . . . . . **hammer float off**

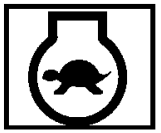




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(11) *Throttle decrease*

Press . . . . . **decreases rpm**



(12) *Horn*

Press . . . . . **sounds horn**



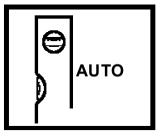
(13) *Two-Speed ground drive key*

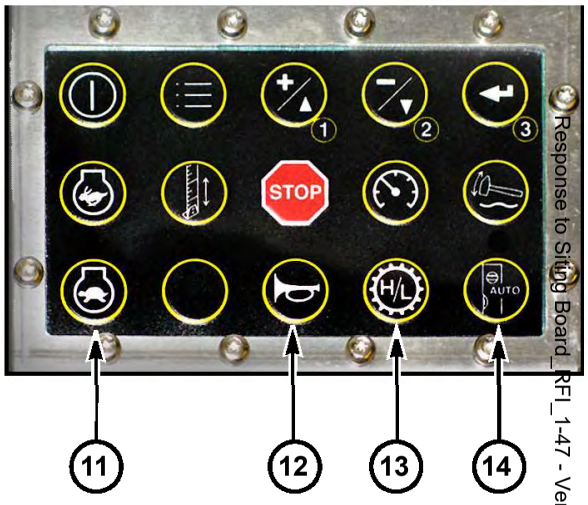
Press . . . . . **toggles between high and low ground speeds**



(14) *Auto plumb key*

Automatically positions the mast vertically.
Press . . . . . **activates auto plumb**
Press second time. . . . . **cancels auto plumb**





Auto plumb does not function when:

- Mast is tilted 5° or more away from machine, or 11° or more toward machine (with hammer in low position).
- Mast is tilted 5° or more in any direction from plumb (with hammer in a high position).
- Hammer is engaged.
- Mast functions are engaged.
- Ground drive is engaged.

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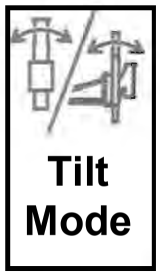
(15) *Mast tilt button* . . . . . .Hold button and use *right joystick* (A) to tilt mast

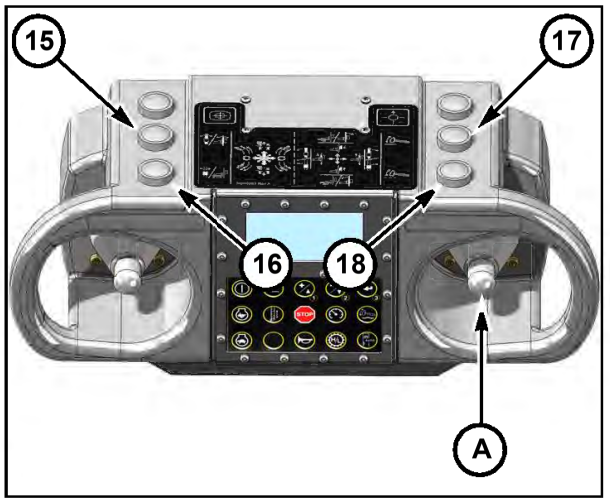
Push joystick left . . . . . **mast tilts toward rear of machine**

Push joystick right . . . . . **mast tilts toward front of machine**

Push joystick forward . . . . . **mast tilts away from machine**

Pull joystick back . . . . . **mast tilts toward machine**





(16) *Mast slide button* . . . . .Hold button and use *right joystick* (A) to slide mast

Push joystick left . . . . . **mast slides toward rear of machine**

Push joystick right . . . . . **mast slides toward front of machine**

Push joystick forward . . . . . **mast slides away from machine**

Pull joystick back . . . . . **mast slides toward machine**



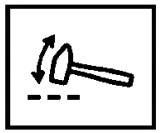
(17) *Hammer on/off button*

Press and release . . . . . **turns hammer on**
Press again . . . . . **turns hammer off**



(18) *Hammer momentary on button*

Press and hold . . . . . **hammer on**
Release . . . . . **hammer off**



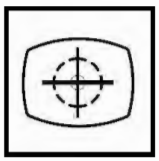
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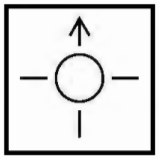
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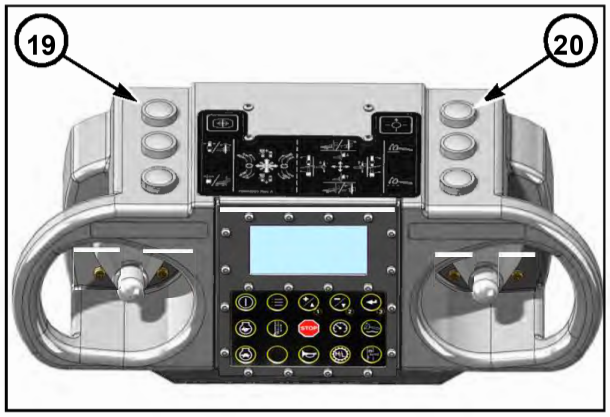
(19) GPS auto target (option)
For use with machines equipped with compatible, third-party GPS system. If equipped, slides mast to a preset, GPS planned position within the horizontal slide range (both X/Y axes). Refer to “Auto Target Tolerance Screen,” *page 20-30.*

(20) Auto home mast slide (enhanced cylinder option)

If equipped, slides mast to a preset, user adjusted position within the horizontal slide range (both X/Y axes). Refer to “Define X Home and Y Home Position Screens,” *page 20-31.*







Remote Control Screens

Remote control display screens are identical to machine controller screens.

Refer to “Controller Screens,” *page 20-24.*

Enable/Disable Remote Control

To enable the remote control:

Step 1: Press *power key* **(1)** to turn remote control on.

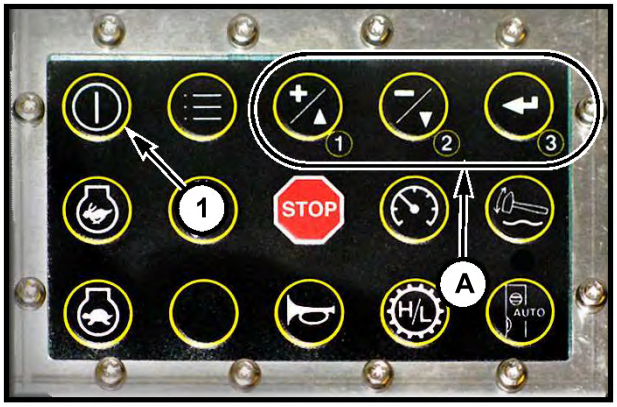
Step 2: Wait for “Enter Code” to appear on the remote control display and press *keys 1, 2, 3* **(A)** in sequence to enable the remote control.

If an operator sits in the seat or a joystick control on the machine is activated, remote will be disabled and functions in progress will stop. Remote cannot be enabled again until operator leaves the seat and machine joystick controls are returned to neutral.

To turn remote control off:

Step 1: Press and hold *power key* **(1)** until screen is blank.

Step 2: Release *power key*.



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Remote Control Joysticks

(1) *Left remote joystick*

(2) *Right remote joystick*



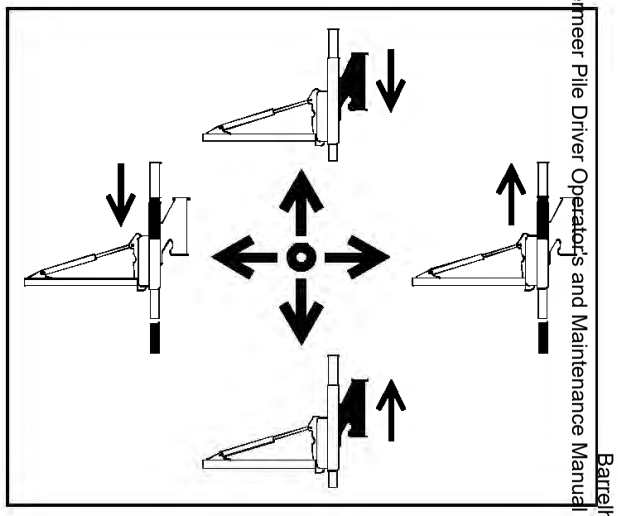
Mast and Hammer Raise/Lower

Move *right remote joystick* left. . . . . **lower mast**

Move *right remote joystick* right . . . . . **raise mast**

Push *right remote joystick* forward . . . . . **lower hammer**

Pull *right remote joystick* backward. . . . . **raise hammer**



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Ground Drive Controls

Remote control steering functions using *left remote joystick*:

(1) Move joystick forward and left.

(2) Move joystick forward.

(3) Move joystick forward and right.

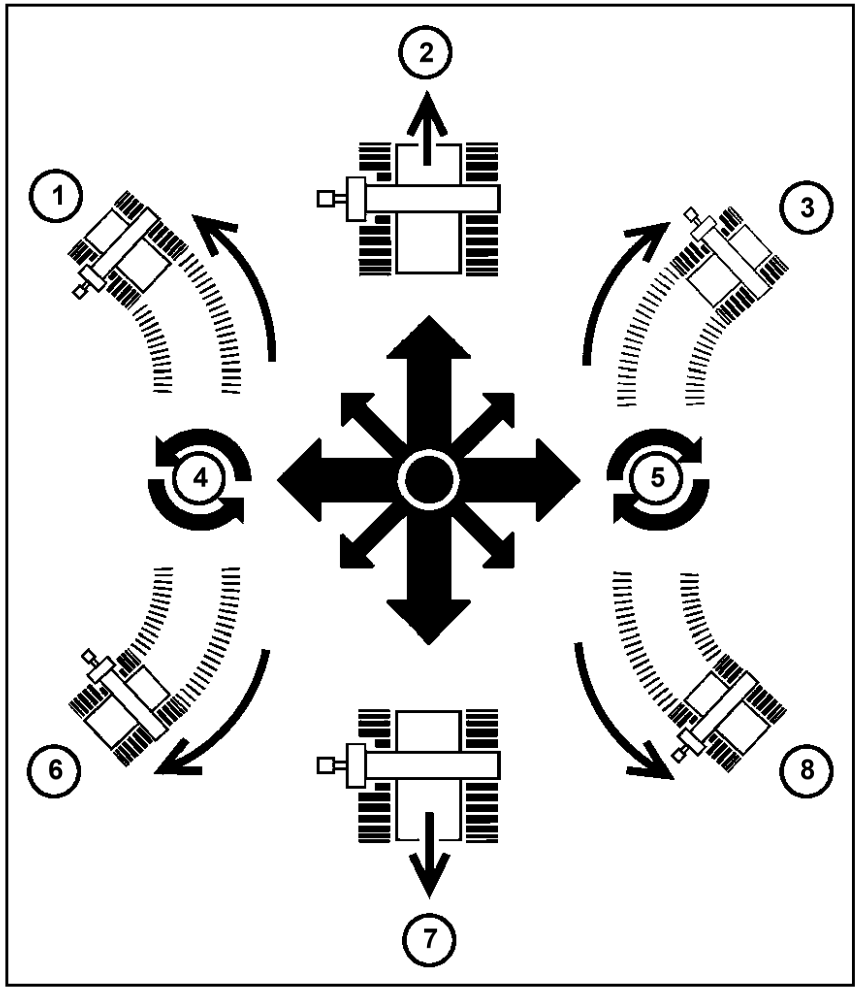
(4) Move joystick left from neutral to counterrotate counterclockwise.

(5) Move joystick right from neutral to counterrotate clockwise.

(6) Move joystick backward and left.

(7) Move joystick backward.

(8) Move joystick backward and right.



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Registering the Remote Control

The remote control must be registered to a machine the first time it is used with that machine.

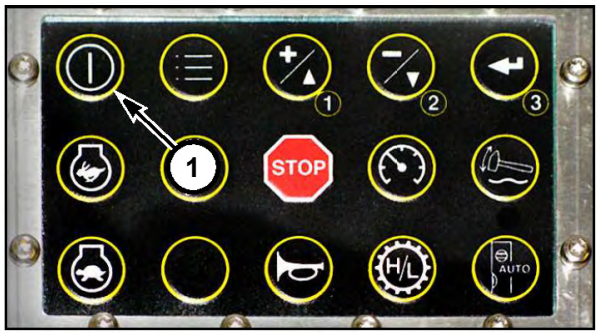
Step 1: Press *power key* **(1)**. The connecting screen **(2)** appears.

The antennae symbol **(3)** with a diagonal line appears when the remote control is not registered to the machine. The diagonal line disappears when the remote control is successfully registered.

Step 2: Press the *menu key* **(4)** on the machine controller.

Step 3: From the menu, select “Remote Register.” Refer to “Main Menu Screen,” *page 20-27.*

Step 4: Press *enter key* **(5)**.





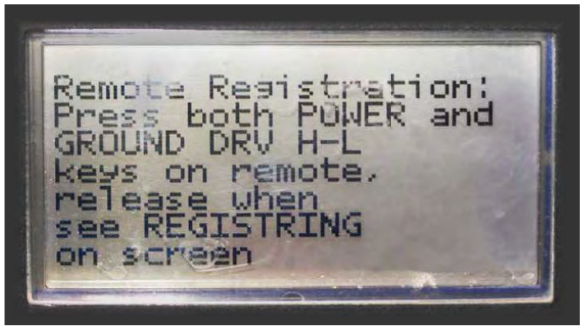


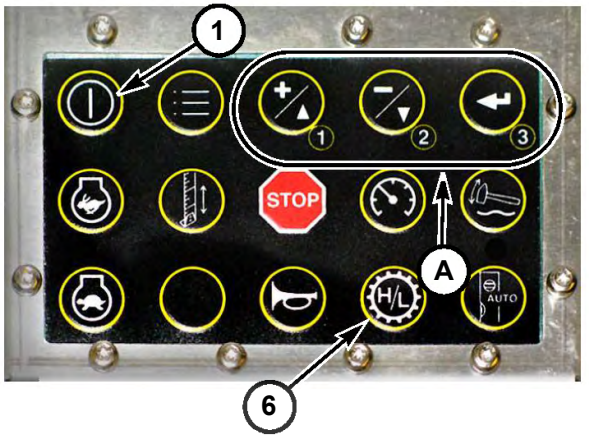
Step 5: Machine controller screen now displays instructions: Press and hold both *Power key* **(1)** and *two-speed ground drive key* **(6)** on remote control; release when “REGISTERING” is on the remote-control screen.

Step 6: When remote-control screen prompts for a password, press *keys 1, 2, 3* **(A)** in sequence.

The remote control is now registered. The beacon should turn on.

The remote-control screen should match the controller screen.



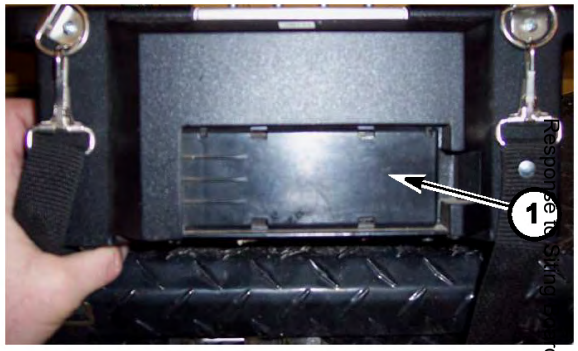


Remote Control Batteries

Remote control uses six AA batteries. Remove battery pack **(1)**. Install new batteries and place battery pack back into position.

Batteries should last 40 hours or more. A battery status symbol on the remote control LCD displays the current battery charge level/status during startup as follows:

	Battery is fully charged.		Battery is 10 – 90% charged.
	Battery is discharged.		Battery is not connected.



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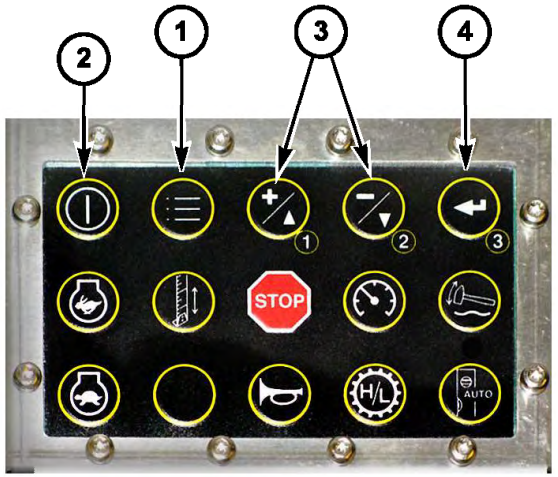
Remote Control – Settings Menu

(1) *Menu key*

(2) *Power key*

(3) *Arrow keys*

(4) *Enter key*



With remote control power on, press and hold *menu key* down and then press *power key* for approximately two seconds. The settings menu will appear. Use *arrow keys* to scroll through settings menu. Use *enter key* to select a highlighted menu item. Press and hold *menu key* down and press *power key* to leave a selected screen or the settings menu; or scroll to “EXIT.”

- VERSIONS
  Press *enter key* to view software version and remote control model number.

- BACKLIGHT
  Press *enter key* to turn display backlight on/off.

- REGISTER
  Refer to “Registering the Remote Control,” *page 21-9.*

- BASE PWR
  For Vermeer dealer use.

- REMOTE PWR
  For Vermeer dealer use.

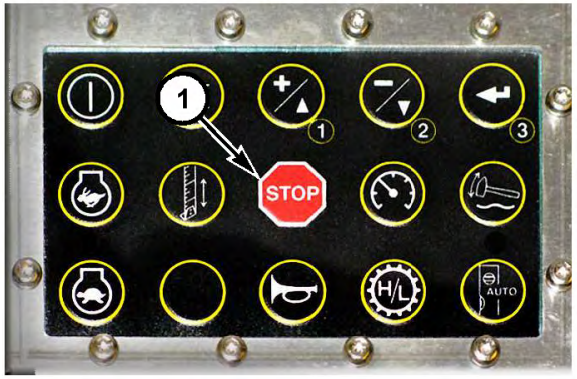
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- NEXT CHAN
  - Change the communications channel when interference from another electronic device is suspected.
  - Remote control must be enabled. Refer to “Enable/Disable Remote Control,” *page 21-6.*
  - With remote control on, enabled, and within communication range of the machine, press the *enter key* once to select the next available channel. Allow up to 10 seconds for new channel to register with base unit.
- FIELD STR
  For Vermeer dealer use.
- CONTRAST+
  Press *enter key* repeatedly to increase display contrast to desired level.
- CONTRAST-
  Press *enter key* repeatedly to decrease display contrast to desired level.
- SELF TST 1
  For Vermeer dealer use.
- SELF TST 2
  For Vermeer dealer use.
- MFG RANGE
  Not used.
- SET DEFAULT
  Press *enter key* to reset remote control to default settings. After reset, the remote control must be re-registered to the base unit. Refer to “Registering the Remote Control,” *page 21-9.*
- EXIT
  Press *enter key* to exit the settings menu.

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Remote Control Operating Range

These operating ranges assume the remote-control system including transmitter, batteries, and receiver are in correct operating condition.



Normal range: within 100 ft (30 m)

Maximum recommended range: up to 300 ft (91 m)

- Check range before operating machine.
- Do not exceed usable operating range.
- Recharge or replace battery if range is not at least 100 ft (30 m) (refer to maintenance manual for procedures).
- Range may exceed 300 ft (90 m).

A symbol (below) on display indicates whether the remote control is in or out of range:

	Remote Control communicates with base.
	Remote Control does not communicate with base.

Non-communication symbol displays whenever remote control is out of range. While remote control is out of range, track functions and all momentary switch functions on the remote control stop. Communication symbol displays as soon as the remote control comes back within range.

NOTICE: *Engine stop key* **(1)** will not function when remote control is out of range.

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Section 22: Starting Procedure

Starting the Engine

Operator should be seated at machine controls, with seat belt fastened, when starting the engine.

Step 1: Move all controls to neutral.

Step 2: Turn *keyswitch* **(1)** to run position and wait for glow plug timer to expire.

Step 3: Turn *keyswitch* to start position; release *keyswitch* when engine starts.

- Display **(2)** shows engine screen for five seconds, then shows main screen.
- When *keyswitch* is in run position, “Preheat Wait” message may appear on controller display for up to seven seconds, depending on coolant temperature.

NOTICE: If engine does not start within 15 seconds, turn key off, wait 30 seconds, then repeat engine starting sequence. Do not allow the starter motor to run continuously for more than 15 seconds.

Step 4: Verify that oil pressure indicator light **(3)** goes out.

Step 5: Warm up engine. Do not operate the engine under load until engine has warmed up for approximately three to five minutes at low speed.



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Cold Weather Starting

Refer to the Engine Operation Manual for cold weather starting. When temperature may drop below 5°F (-15°C), remove battery from machine and store indoors until next machine use.

When operating in cold weather, use recommended engine oil viscosity and fuel to reduce starting issues.

Step 1: Turn *keyswitch* to run position. Screen stating “Preheat Wait” will appear on controller display for up to seven seconds, depending on coolant temperature.

Press *enter key* to clear advisory from screen before display time has expired.

Step 2: Screen stating “Preheat Ready” will appear on controller display for a maximum of 10 seconds. Turn *keyswitch* to start position.

Hydraulic Fluid

Allow adequate time for hydraulic oil to warm up, especially in cold weather. Refer to the specifications section of the maintenance manual for recommended hydraulic fluids.

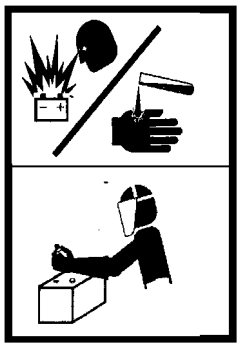
Reduce engine speed if hydraulic pump makes a high-pitched noise, indicating lack of oil which can damage the pump.

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Jump-Starting

Battery Explosion – Prevent



WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Battery explosion can blind. Acid can blind and burn. Tools and cable clamps can make sparks.

Do not smoke. Shield eyes and face. Read instructions.

Do not jump-start or charge a battery that is frozen or low on electrolyte.

If equipped with battery caps, they must be in place and tight to reduce risk of battery explosion.

NOTICE: Use only a 12-volt system for jump-starting. Do not allow vehicle used to jump-start to be in contact with the disabled machine. Vehicles in contact have a ground connection which allows a spark to occur at the battery when the positive jumper cable is connected or removed.

Battery Burns – Prevent

Battery contains sulfuric acid which can cause severe burns. Prevent contact with eyes, skin, and clothing.

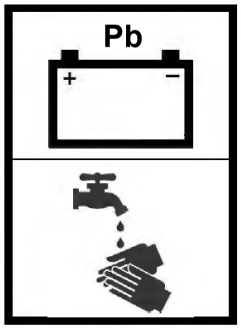
In case of acid contact:

External**:** Flush with plenty of water. If eyes have been exposed, flush with water for 15 minutes and get prompt medical aid.

Internal**:** Drink large quantities of water or milk, then milk of magnesia, beaten egg, or vegetable oil. Call a physician immediately.

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Jump-Starting Procedure



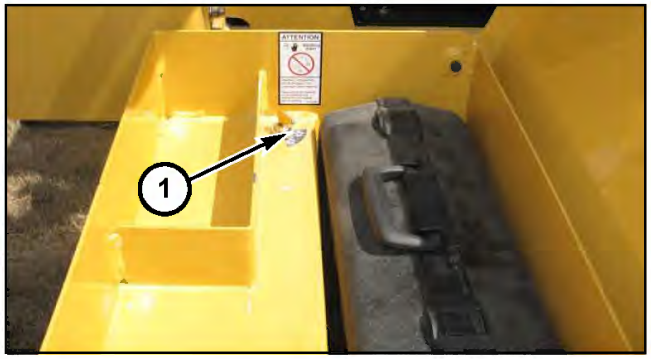
WARNING: Battery post, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.

Wash hands after handling.

Step 1: Turn *keyswitch* to off.

NOTICE: Wait 60 seconds before disconnecting the battery. This is necessary to allow electronic controllers to complete their respective cycles.

Step 2: Turn *battery disconnect switch* **(1)** to disconnect.



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Step 3: Connect jumper cables in this order:

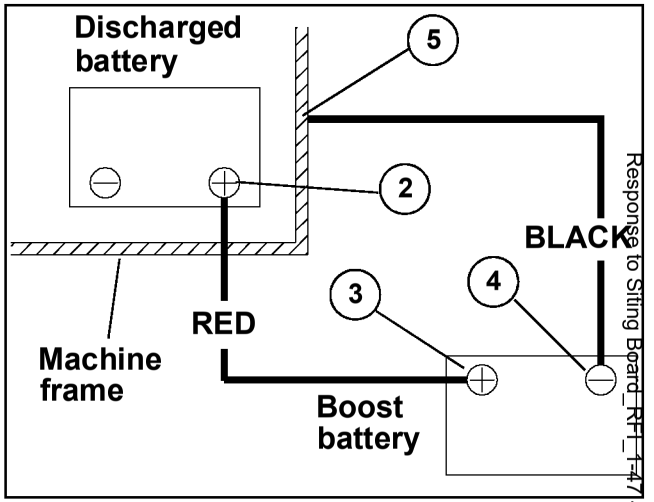
a. Red to discharged battery positive (+) terminal **(2)**.

b. Red to boost battery positive (+) terminal **(3)**.

c. Black to boost battery negative (-) terminal **(4)**.

d. Black to frame **(5)** of machine with the discharged battery. Make connection away from battery, hydraulic lines, and moving parts. Do not attach to the negative (-) terminal of discharged battery.

To prevent sparks near the battery, always disconnect the negative (black) jumper cable from the frame **(5)** before disconnecting the positive (red) cable from the battery.



Step 4: Turn *battery disconnect switch* to connect.

Step 5: Follow *Starting Procedure, page 22-1.*

Step 6: Remove cables in reverse order and install covers over cable clamps. Close and latch battery access shield.

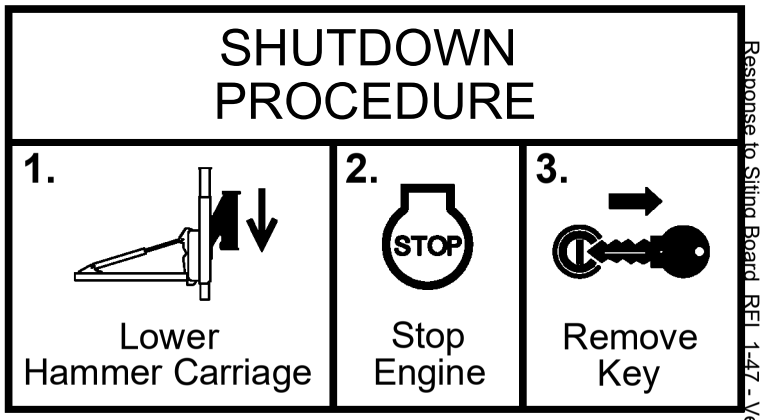
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Section 23: Shutdown Procedure

For your safety and the safety of others, use the shutdown procedure before working on the machine for any reason, including servicing, cleaning, inspecting, or transporting the machine.

A variation of this procedure may be used if so instructed within this manual or if an emergency requires it.



Step 1: Lower hammer.

NOTICE: Whenever practical and safe, allow engine to run at low idle for one to five minutes before shutting down after operating at full power. Please consult machine's engine manual for details.

Step 2: Reduce engine speed to low idle.

Deutz engine: Allow engine to run at low idle for one minute after operating at full load.

Yanmar engine: Allow engine to run at low idle for five minutes after operating at full load.

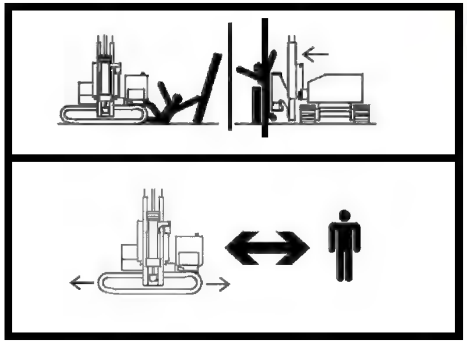
Step 3: Shut off engine and remove key.

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Section 30: Transporting the Machine

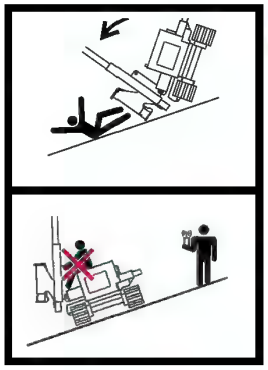
Driving the Machine



WARNING: Machine movement can crush.

Stay away from machine while transporting.

Drive machine at a speed correct for the terrain. When using remote, do not operate machine faster than you can comfortably walk. Keep feet away from the tracks when driving. Do not stop, start, or turn suddenly unless it is necessary. Keep hammer low when driving machine. If driving over uneven ground, fold mast and keep weight balanced over tracks.



WARNING: Rollover possible. Be alert and use extreme caution when operating on hillsides, or near ditches, gullies, holes, or obstructions where rollover could occur. Death or serious injury can result if crushed under the machine. Never allow anyone to be on the downhill side of the machine.

Never allow anyone to ride on machine.

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Safe Operating Slope

Safe operating slope depends on many factors:

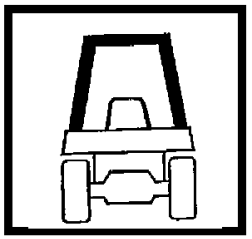
- Machine weight distribution, including mast and pile position
- Height of hammer
- Even or rough ground conditions
- Potential for ground giving way, causing unplanned forward, reverse, or sideways tilt
- Nearness of ditches, ruts, stumps, or other obstructions and sudden changes in slope
- Speed
- Turning
- Braking performance
- Skill of operator

These varying factors make it impractical to specify a maximum safe operating angle in this manual. It is, therefore, important for the operator to be aware of these conditions and adjust operation accordingly. Maximum engine angle and braking performance are two absolute limits which must never be exceeded. These maximums are stated here because they are design limits. These angles are not operating limits and must never be used alone to establish safe operating angles for varying conditions.

- Maximum engine lubrication angle -30° all directions
- Service brake retarding force – equal to traction of both tracks
- Secondary brake – equal to traction of one track
- Park brake holding force – equal to traction of both tracks

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Rollover Protective Structure (ROPS)



WARNING: The rollover protection structure (ROPS) is intended to protect the tractor operator in the event of a rollover. In order for you to be protected by the ROPS, you must wear seat belts. Follow instructions below relating to ROPS safety precautions.

- Do not operate machine with ROPS removed.
- Do not modify ROPS in any manner. Unauthorized modifications, such as welding, drilling, cutting, or adding attachments, could weaken the structure and reduce your protection.
- If ROPS has been damaged or subjected to a rollover, it must be replaced. Do not attempt any repairs.
- The ROPS has been certified to a maximum gross machine weight as stated on the label located on the ROPS. Under no circumstances may total gross weight of machine exceed weight specified on ROPS label.
- If ROPS must be replaced, be sure to use original parts ordered from Vermeer Corporation.

If rollover occurs:

- Brace yourself and stay on the machine. Keep the seat belt fastened.
- Hold on firmly and lean away from the point of impact.

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Mount and Dismount Safely

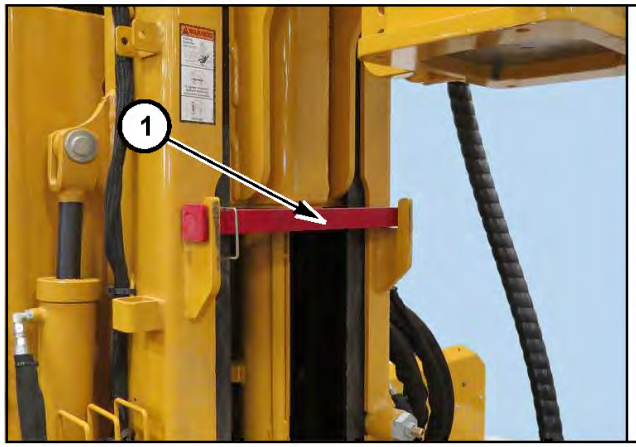
- Face machine when mounting and dismounting.
- Maintain a three-point hand/foot contact with the access system (one hand and two feet or two hands and one foot). Keep all handrails in place.
- Do not use any controls or screens as handholds when climbing on or off the machine.
- Never jump off the machine.
- Keep steps, platforms and operator’s area clear of objects and debris, which may cause difficulties stepping on or off the machine or interfere with control movement.
- Never get on or off a moving machine.

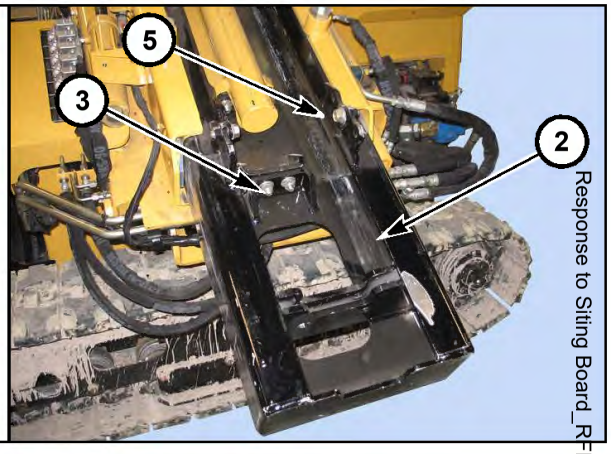
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Preparing for Trailer Transport

Machine With 10-ft Mast

Additional steps may be required if a compatible third-party GPS system is installed.

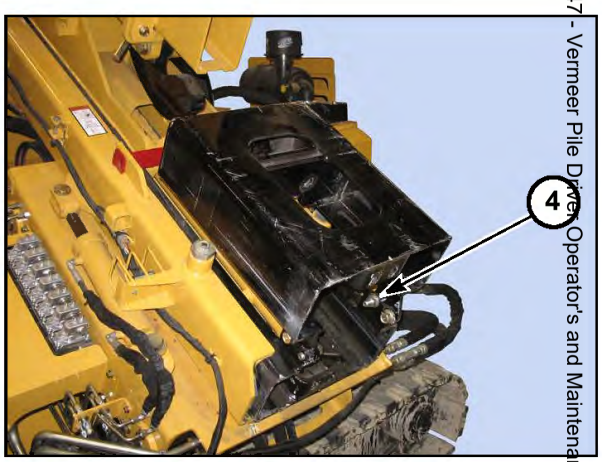




Step 1: Follow *Starting Procedure,* page *22-1.*

Step 2: Center mast vertically and horizontally.

NOTICE: Failure to center mast before tilting toward machine may result in mast colliding with cradle.



Step 3: Lower mast.

Step 4: Raise hammer.

Step 5: Install hammer support bar **(1)** in bracket.

Step 6: Lower hammer to contact hammer support bar.

Step 7: Tilt mast slightly toward machine.

Step 8: Loosen bolts **(5)**.

Step 9: Fold up bottom section **(2)** of mast: remove bolts **(3)**, attach suitable lifting device to bottom section of mast. Bottom mast section weighs 85 lb (39 kg). Fold, install bolts **(3)** in side holes **(4)** with threads toward center of mast.

NOTICE: Install bolts **(3)** with threads toward center of mast. Installing bolts incorrectly may damage mast.

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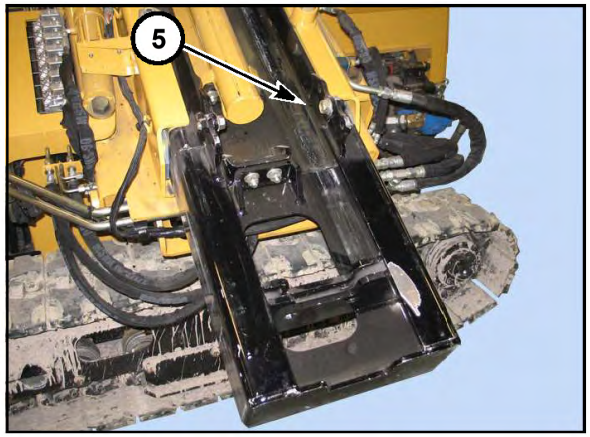
Depending on size of guide installed, the hammer may need to be raised slightly for clearance when folding bottom section. If hammer is raised for clearance, lower hammer until it contacts support bar or bottom section. If hammer does not contact support bar, then remove support bar and stow.

Step 10: Tighten bolts **(5)**.

Step 11: Tilt mast fully toward machine.

Step 12: Slide mast toward machine until it stops. Adjust as needed so that mast does not collide with cradle.

Step 13: Verify transport dimensions are correct for machine with 10-ft mast. Refer to *page 70-5.*



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Machine With 15-ft Mast

Additional steps may be required if a compatible third-party GPS system is installed.

Step 1: Follow *Starting Procedure,* page *22-1.*

Step 2: Center mast vertically and horizontally.

NOTICE: Failure to center mast before tilting toward machine may result in mast colliding with cradle.

Step 3: Lower mast.

Step 4: Raise hammer.

Step 5: Install hammer support bar **(1)** in bracket.

Step 6: Lower hammer to contact hammer support bar.

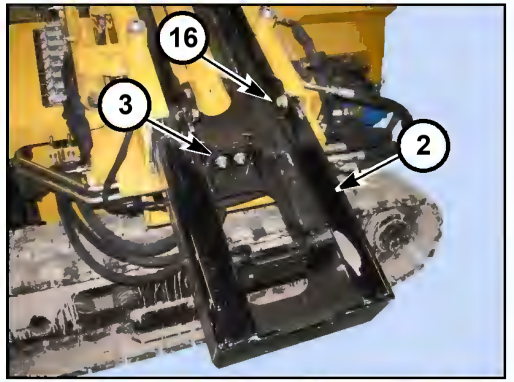
Step 7: Tilt mast slightly toward machine.

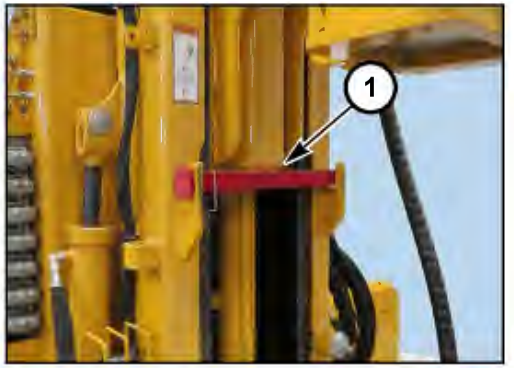
Step 8: Loosen bolts **(16)**.

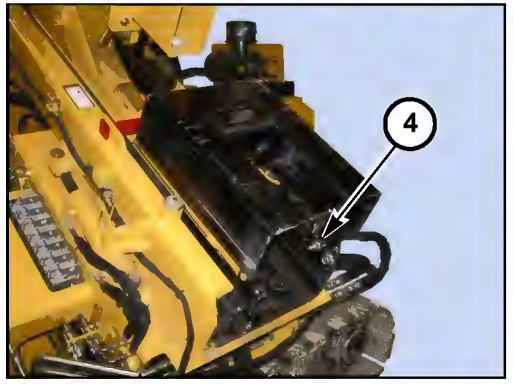
Step 9: Fold up bottom section **(2)** of mast: remove bolts **(3)**, attach suitable lifting device to bottom section of mast. Bottom mast section weighs 85 lb (39 kg). Fold, install bolts **(3)** in side holes **(4)** with threads toward center of mast.

NOTICE: Install bolts **(3)** with threads toward center of mast. Installing bolts incorrectly may damage mast.

Depending on size of guide installed, the hammer may need to be raised slightly for clearance when folding bottom section. If hammer is raised for clearance, lower hammer until it contacts support bar or bottom section. If hammer does not contact support bar, then remove support bar and stow.



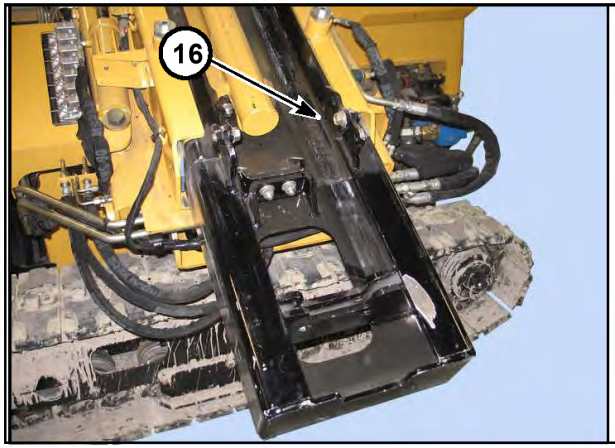


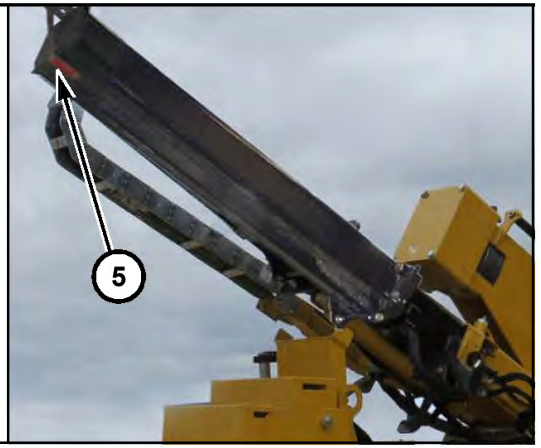


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Step 10: Tighten bolts **(16)**.

Step 11: Tilt mast fully toward machine, and attach a suitable lifting device to top of mast **(5)**. Top section of 15-ft mast weighs 190 lb (86 kg).





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Step 12: Raise mast until top of hinge bracket **(6)** aligns with the lower mast slide adjusters **(7)**.

NOTICE: If mast is lifted too high with bottom section folded, lower mast adjusters could fall out of holders.

Step 13: Adjust lifting device to support the mast.

Step 14: Remove four bolts **(8)** securing two halves of mast. Retain bolts in toolbox.

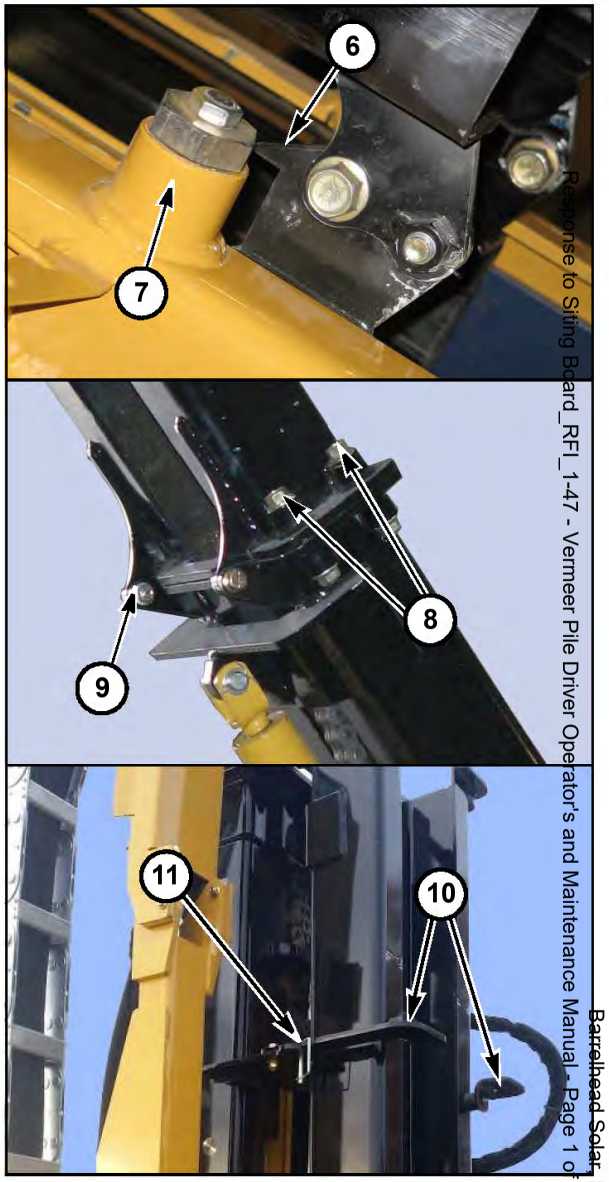
Step 15: Tilt mast away from machine, allowing top half of mast to fold down at hinge **(9)**. Adjust lifting device as needed during this process until both mast sections are vertical.

Step 16: Remove lifting device from top of mast.

Step 17: Remove linchpins **(11)** and engage locks **(10)**.

Step 18: Insert linchpins **(11)** in locks (**10)**.

Step 19: Tilt mast toward machine until it stops.

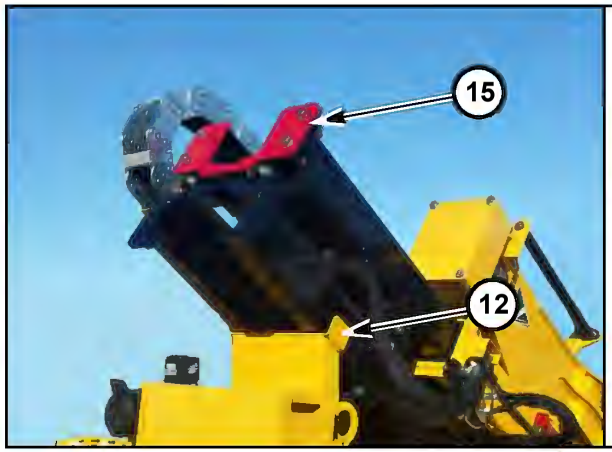


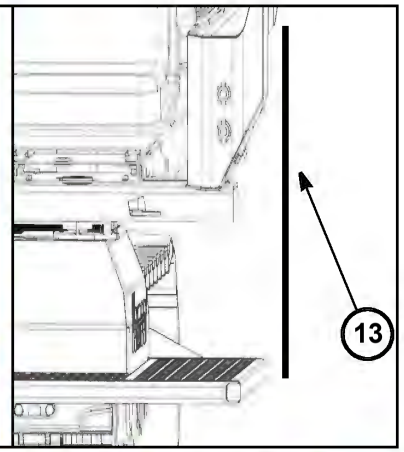
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Step 20: Slide mast toward machine until it starts to contact cradle **(12)**. Adjust as needed so that mast does not collide with cradle.

Step 21: Verify that bottom of lowered mast **(13)** is even with side of operator's station platform.

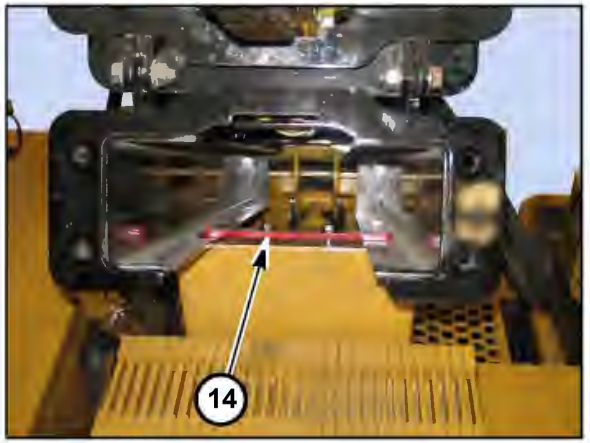
Step 22: Install lock plate **(14)** and bolts.





Step 23: Install mast cap plate **(15)** on lower half of mast hinge. Secure with four bolts. Use shorter bolts with plate, stored in toolbox.

Step 24: Verify transport dimensions are correct for machine with 15-ft folded mast. Refer to *page 70-5.*



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Machine With 20-ft Mast

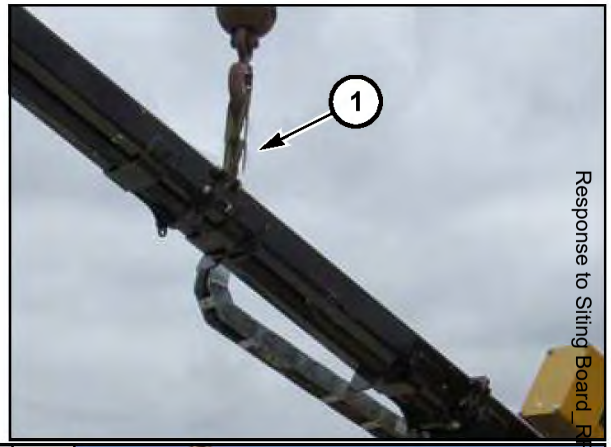
Additional steps may be required if a compatible third-party GPS system is installed.

Step 1: Follow *Starting Procedure,* page *22-1.*

Step 2: Center mast vertically and horizontally.

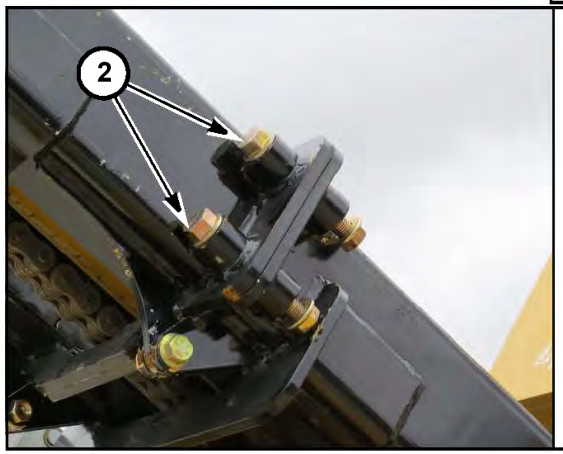
NOTICE: Failure to center mast before tilting toward machine may result in mast colliding with cradle.

Step 3: Tilt mast completely toward machine and attach a suitable lifting device slightly above bolted joint of top two mast sections **(1)**. Top two sections of mast weigh 380 lb (172 kg) combined.



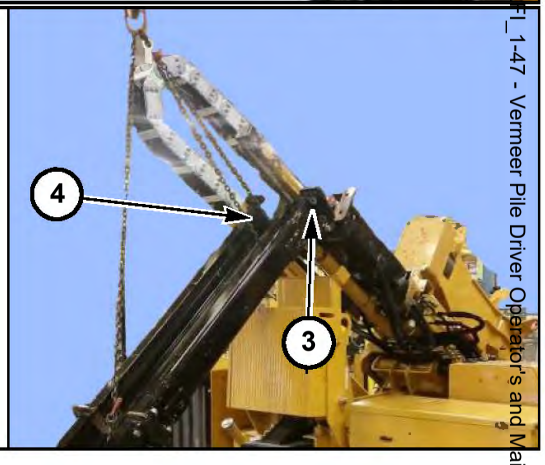
Step 4: Adjust lifting device to support the mast.

Step 5: Remove four bolts **(2)** securing top two sections of mast to lower portion of mast. Retain bolts in toolbox.



Step 6: Lower lifting device and let top two sections of mast fold down at hinge **(3)** until properly supported.

Step 7: Attach a second suitable lifting device to top two sections of mast **(4)** close to the hinge.



Step 8: Properly support top two sections of mast to prevent movement and remove bolts from hinge **(3)**.

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Step 9: Lower top two sections of mast to the ground.

Step 10: If needed, remove four bolts **(5)** to disassemble top two sections of mast.

Step 11: Install mast cap plate **(6)** on lower portion of mast at hinge. Secure with four shorter bolts stored in toolbox.

Step 12: Lower mast completely.

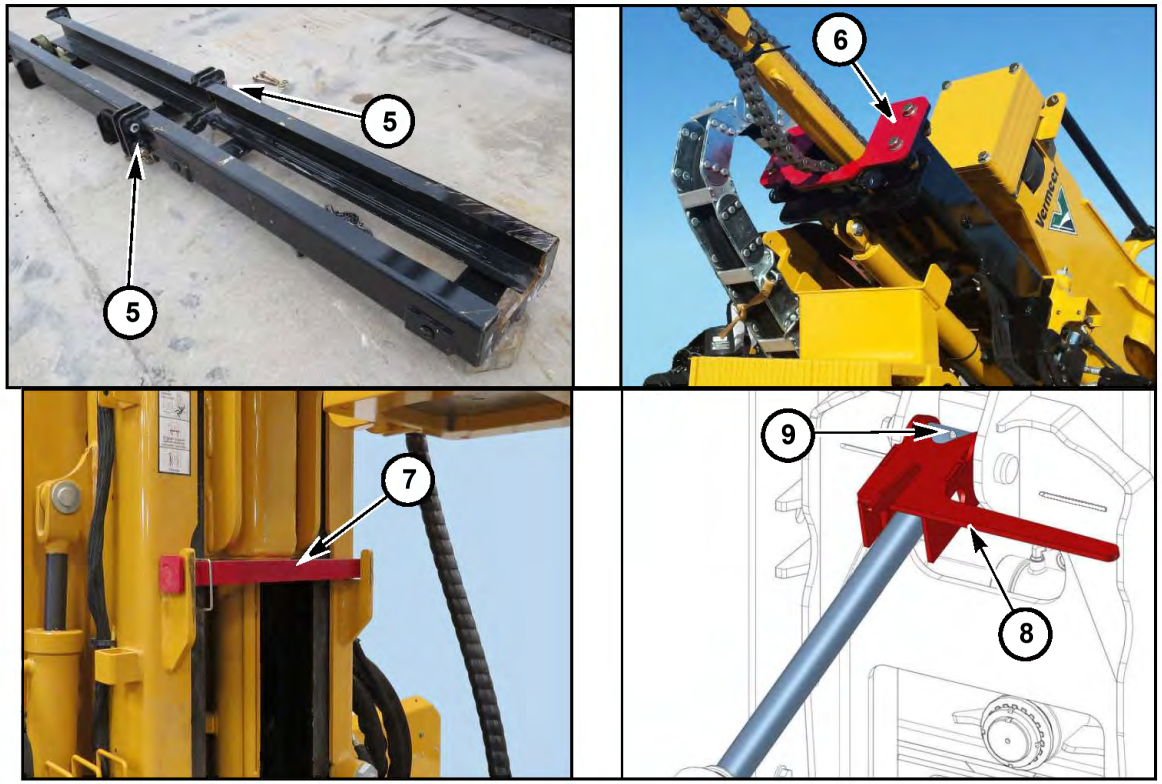
Step 13: Raise hammer.

Step 14: Install hammer support bar **(7)** in top bracket (if more than one bracket).

Step 15: Lower hammer to contact hammer support bar **(7)**.

Step 16: If not equipped with mast tilt positioner **(8)**, proceed to Step 17 to remove bottom section. Leave mast tilted toward machine.

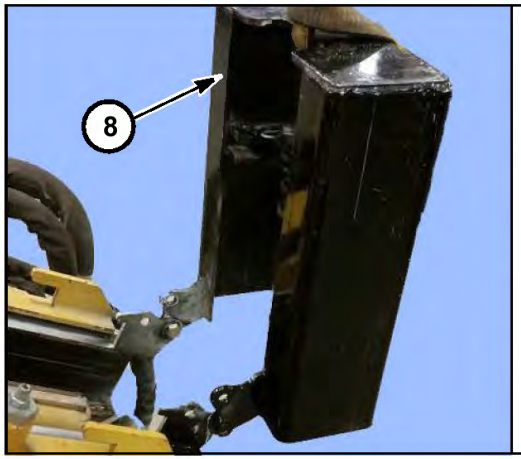
If equipped with mast tilt positioner **(8)**, tilt mast away from machine to vertical position, place on mast tilt cylinder pivot **(9)** (mast may need to be raised slightly or slid away from machine slightly to install **(7)**), tilt mast fully toward machine, then proceed to Step 18 to fold bottom section.

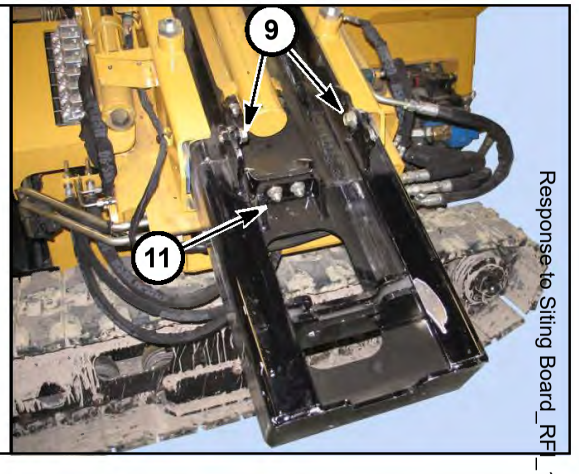


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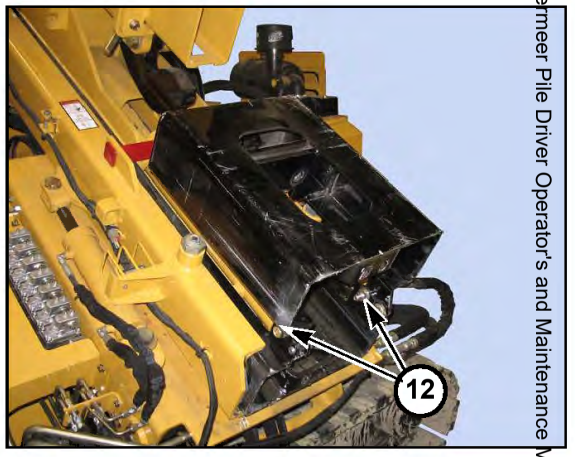
Step 17: Attach suitable lifting device to bottom section of mast **(8)**. Bottom mast section weighs 85 lb (39 kg).





- Remove bolts **(11)** and loosen bolts **(9)**.
- Lift bottom section and remove bolts **(9)**.
- Remove bottom mast section.
- Store bolts **(9)**, **(11)** and bottom section.
- Tilt mast fully toward machine.
- Slide mast fully toward machine, adjusting as needed so that mast does not collide with cradle.
- Proceed to Step 19.

Step 18: Attach suitable lifting device to bottom section of mast **(8)**. Bottom mast section weighs 85 lb (39 kg).



- Loosen bolts **(9)** to allow folding.
- Remove bolts **(11)**.
- Fold up bottom section of mast.
- Install bolts **(11)** into holes **(12)** with threads toward center of mast.

NOTICE: Depending on size of guide installed, hammer may need to be raised slightly for clearance when folding bottom section. Lower hammer to contact support bar after folding. If hammer does not contact support bar, then remove support bar and store.

- Tighten bolts **(9)**.

Step 19: Verify transport dimensions are correct for 20-ft mast machine. Refer to *page 70-5.*

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Reducing Transport Width (20-ft Mast Only)

After following transport preparation procedure, if machine is still too wide for local regulations, follow this procedure to fold down hose carrier.

Step 1: Attach suitable lifting device to hose carrier **(1)**. This portion of hose carrier weighs 500 lb (227 kg).

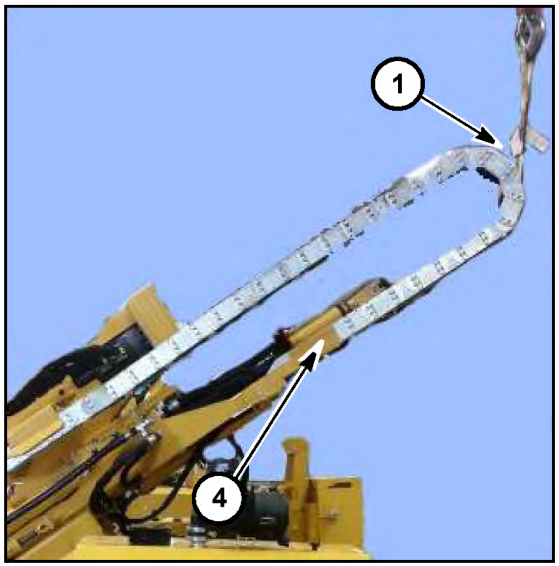
Step 2: Adjust lifting device to support the hose carrier.

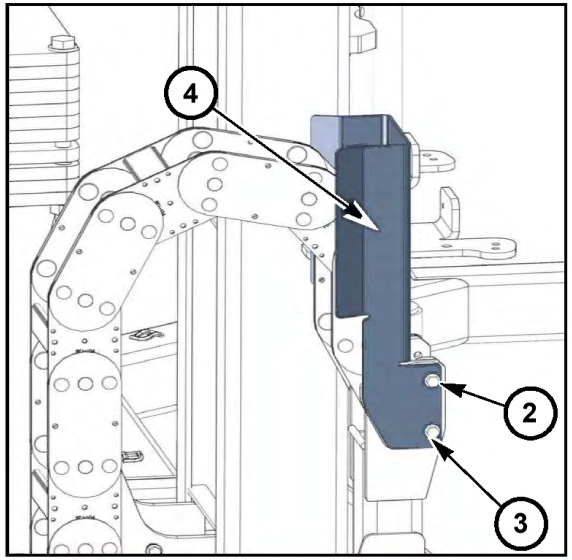
Step 3: Remove bolts **(2)** and loosen bolts **(3)** while supporting hose carrier support **(4)** to keep it from lowering quickly.

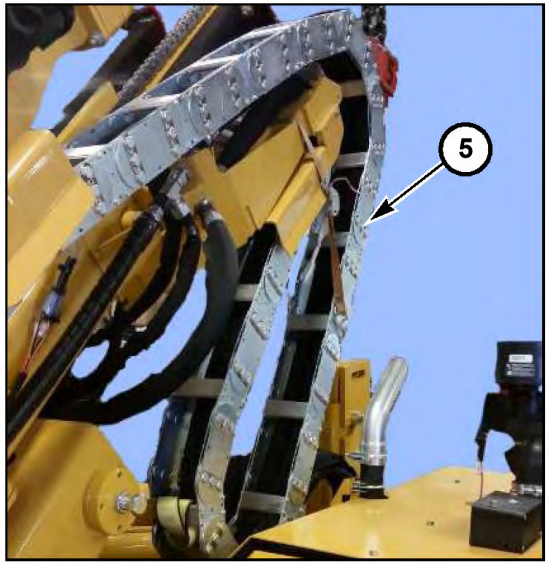
Step 4: Fold hose carrier down into position **(5)**.

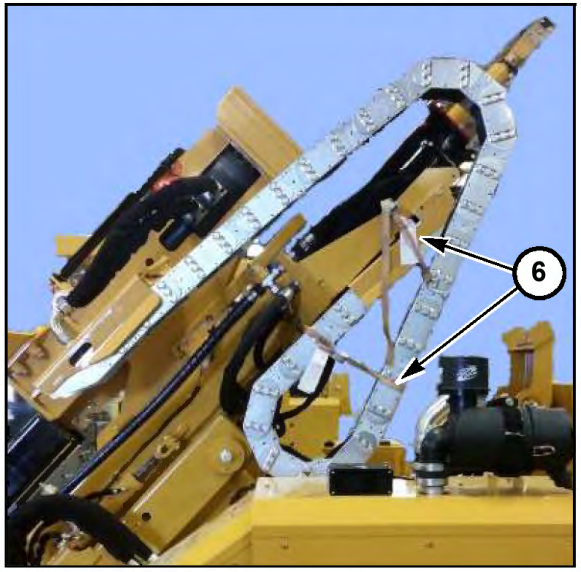
Step 5: Attach straps **(6)** to secure hose carrier.

Step 6: Verify transport dimensions are correct. Refer to *page 70-5.*







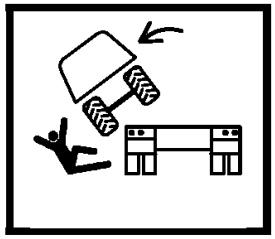


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Trailering the Machine

Loading



WARNING: Unintended machine movement may occur when loading or unloading on slippery, dirty or uneven trailer surfaces. Death or serious injury can result if struck or crushed by machine. Ensure trailer is level and all loading surfaces are clean and free of debris. Do not attempt to load onto slippery trailer surfaces. Use smooth and controlled steering movements.

- Read the towing vehicle and trailer manuals for safety precautions and information.
- Ensure gross weight of the machine with attachments is within the weight limits of the trailer and towing vehicle. Refer to “Machine Specifications,” *page 70-2.*
- Properly attach trailer to towing vehicle and chock wheels or engage park brake of towing vehicle.
- Ensure you are qualified to operate the machine. Refer to “Operator Qualifications,” *page 40-1.*
- Slowly drive machine on and off trailer squarely to minimize steering.
- Do not attempt to steer machine when balanced at trailer/ramp transition.
- Position machine at location for tie-downs and weight distribution as recommended by trailer manufacturer.

Step 1: Center machine on the trailer centerline; drive squarely onto the trailer. Stop at the tie-down position for correct weight distribution as recommended by the trailer manufacturer.

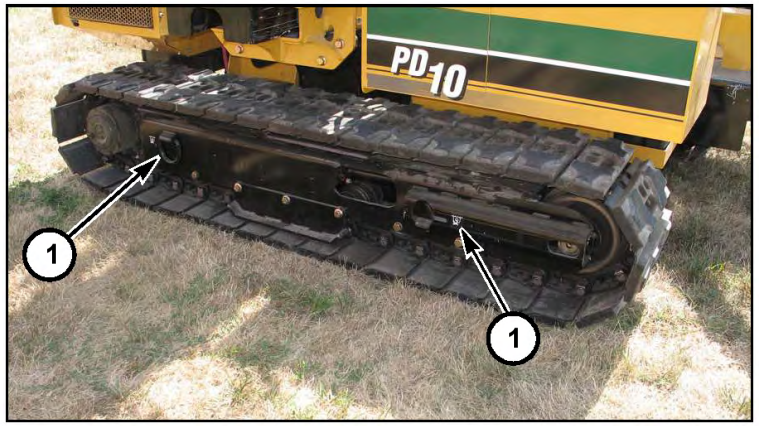
Step 2: Follow *Shutdown Procedure,* page *23-1.*

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Tie-Down Procedure

Fasten each corner of the machine to the trailer using tie-downs **(1)** provided on the machine.

Consult state and federal highway regulations for requirements on the proper securing of equipment.



Unloading

To unload machine, park trailer on a level surface. Unload machine only when trailer is attached to a tow vehicle.

Step 1: Remove tie-down chains.

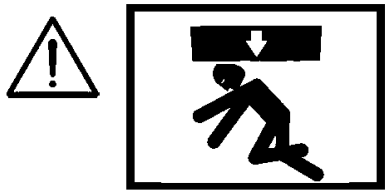
Step 2: Follow *Starting Procedure,* page *22-1.*

Step 3: Use a slow ground speed to unload machine.

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Lifting the Machine



WARNING: Never lift machine over personnel. The load may fall or shift, crushing anyone beneath it.

No provisions are made for lifting the machine. If transport requires that machine be lifted, it must be loaded and secured in an appropriate container.

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Retrieval

Towing device (chain, cable, or strap) must have a minimum working load of 150% of towing machine weight.

NOTICE: Do not tow machine more than 500 ft (150 m). Do not exceed 1 mph (1.5 km/h).

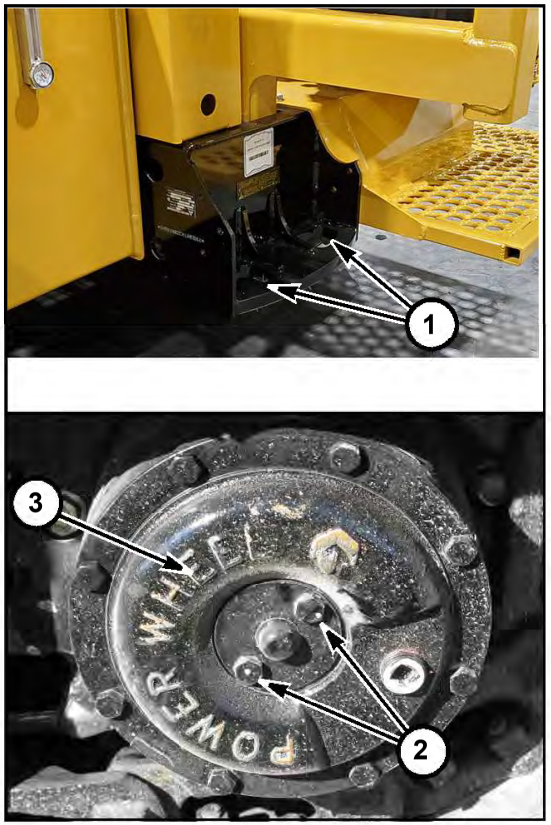
Use this procedure when towing a machine which has become mired or disabled.

Step 1: Connect tow towing device to tow points **(1)**.

Step 2: Remove and retain two 5/16 in screws **(2)** on each of two planetary cover plates **(3)**, one on each side of machine.

Step 3: Flip plates over and install with longer 1.5 in screws, so that gears will freewheel.

Step 4: When finished towing, install covers (using retained 5/16 in screws) in original configuration to engage gears.



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Section 40: Preparation

Preparing Personnel

Operator Qualifications



WARNING: Read Operator's Manual and safety signs, and watch the operations and safety video, before operating machine.

Allow only responsible, properly instructed individuals to operate machine.

Become familiar with the controls, operation and use of the machine under the supervision of a trained and experienced operator.

The operator must be familiar with the workplace's safety rules and regulations, and must be mentally and physically capable of operating the machine safely.

Safety Conscious Operators and Workers

Operators and workers must use reasonable accident-prevention measures, including correctly locating all underground utilities.

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Training

Before operating the PD10, the operator and crew must be trained in the operation of the unit. Conduct initial training at a site free of underground utilities and review the following:

- All sections of this manual
- Processes and procedures used to locate underground utilities
- Jobsite safety, including safety barriers and protective clothing, as well as operating and emergency procedures
- Machine shutdown procedure
- Transportation of the unit
- Setup of the unit
- Pile driving and removal

Safety Signs and Operating Instructions

Safety signs and operating instructions provide information on potential safety hazards and safe operating instructions.

Operator Presence Switch

The operator presence system uses a switch in the seat **(1)** to detect the presence of an operator. The operator must be seated in order to operate a function.



If the operator leaves the seat while operating a function, the function will stop within three seconds. All controls must be returned to neutral before any function can be resumed.

The operator presence system is intended for your safety and must be maintained in good functional condition. Contact your Vermeer dealer if it does not function properly.

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Seat Belt

Seat belts must be worn at all times while the machine is being operated from the operator's station.

The seat belt is an essential part of the rollover protection system. It helps keep the operator in the protected area inside rollover protective structure. Inspect seat belt every time it is used, looking for cuts, or worn webbing, or any defect in the latch assembly. If any wear or damage is noted, do not operate machine until seat belt is replaced.

If it is necessary to clean belts, use a mild soap solution and lukewarm water. Do not use bleach, dye, solvents, or other chemicals, which may weaken the belts.

To fasten automatic locking retractor seat belts:

Step 1: Pull latch steadily until it reaches buckle. If retractor locks before latch reaches buckle, allow belt to full retract and then retry.

Step 2: Insert latch into buckle until positive snap is heard.

Step 3: Verify there are no twists in the seat belt webbing.

Step 4: Allow retractor to take up any slack in the webbing.

Step 5: Pull sharply on the webbing to make sure retractor is locked.

Wear seat belt low and snug.

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Rollover Protective Structure (ROPS)

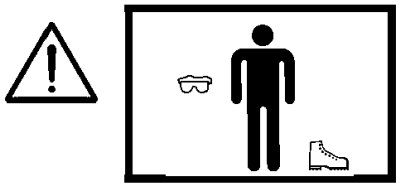
- Do not operate machine with ROPS removed.
- Do not modify ROPS in any manner. Unauthorized modifications, such as welding, drilling, cutting, or adding attachments, could weaken the structure and reduce your protection.
- If ROPS has been damaged or subjected to a rollover, it must be replaced. Do not attempt any repairs.
- The ROPS has been certified to a maximum gross machine weight as stated on the label located on the ROPS. Under no circumstances may total gross weight of machine exceed weight specified on ROPS label.
- If ROPS must be replaced, be sure to use original parts ordered from Vermeer Corporation.

If rollover occurs:

- Brace yourself and stay on the machine. Keep the seat belt fastened.
- Hold on firmly and lean away from the point of impact.

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Personal Protection



WARNING: Wear required personal protection equipment.Wear close-fitting clothing and confine long hair. Avoid wearing jewelry such as rings, wristwatches, necklaces or bracelets. Always wear safety glasses and safety shoes.

Working around the machine requires you to wear protective equipment. Always wear a hard hat, safety shoes, hearing protection, and eye protection. If working near traffic, you may need to wear reflective clothing.

Hearing protection is required when operating the machine. Hearing protection devices provide differing levels of sound reduction. It is important to select a device that is adequate and appropriate for your specific work environment. Actual sound levels may vary widely, depending on your working conditions. To determine the level of hearing protection your work environment requires, consult your local environmental noise specialist.

Safety shoes must be rated for impact (I/75), compression (C/75), and metatarsal protection (Mt/75) or have equivalent ratings, in compliance with national or regional standards.

Eye protection must consist of wraparound safety glasses or goggles.

Others working in immediate area must also wear the above listed protective equipment.

Wear close-fitting clothing and confine long hair.

Do not wear jewelry, such as rings, wristwatches, necklaces, or bracelets.

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Sound and Vibration Levels



Levels for Deutz Engine Options

The stated sound levels are representative for a given operating condition. Operating conditions may vary at each jobsite. The actual sound levels for your application and operating conditions may be different.

Equivalent Continuous A-Weighted Sound Pressure at Operator's Ear
as determined by directive 2000/14/EC and ISO 6396. . . . . 114 dB(A)

Guaranteed Sound Power Level
as determined by directive 2000/14/EC, ISO 6395, ISO 3744 . . . . . 132 dB(A)

Whole Body Vibration according to ISO 2631-1 . . . . . .less than 0.5 m/s^2

Right and Left Hand/Arm Vibration according to ISO 5349 . . . . . .less than 2.5 m/s^2

Levels for Yanmar Engine Option

The stated sound levels are representative for a given operating condition. Operating conditions may vary at each jobsite. The actual sound levels for your application and operating conditions may be different.

Equivalent Continuous A-Weighted Sound Pressure at Operator's Ear
as determined by directive 2000/14/EC and ISO 6396. . . . . 105 dB(A)

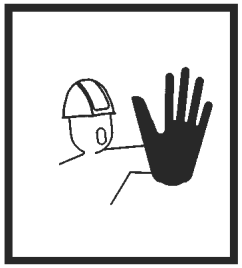
Guaranteed Sound Power Level
as determined by directive 2000/14/EC, ISO 6395, ISO 3744 . . . . . 123 dB(A)

Whole Body Vibration according to ISO 2631-1 . . . . . .less than 0.5 m/s^2

Right and Left Hand/Arm Vibration according to ISO 5349 . . . . . .less than 2.5 m/s^2

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Prepare the Area



WARNING: Keep spectators away.

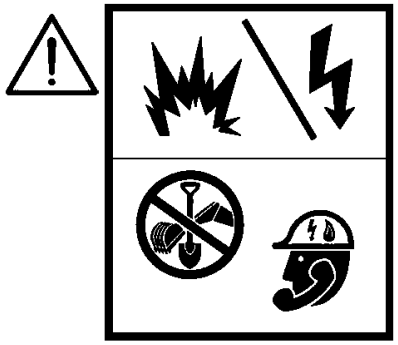
Look for Evidence of Underground Placement

Visually check for:

- Notices of underground placements
- Manhole covers
- Drop boxes
- Recent trenching activity

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Underground Utility Contact



WARNING: Striking an electrical line can cause electrocution. Striking gas line can cause an explosion. Cutting fiber optic cable could result in eye damage by laser light. Death or serious injury possible.

Locate utilities before driving posts. Call 811, 1-888-258-0808, or access www.call811.com (U.S. only); or contact local utility companies or national regulating authority.

Before you start any digging project, call the local One-Call system in your area and any utility company that does not subscribe to the One-Call system. For areas not represented by One-Call Systems International, contact the appropriate utility companies or national regulating authority to locate and mark the underground installations. If all utilities are not properly located, you may have an accident or suffer injuries; cause interruption of services; damage the environment; or, experience job delays.

The One-Call representative will notify participating utility companies of your proposed digging activities. Utilities will then mark their underground facilities by using the following international marking codes:

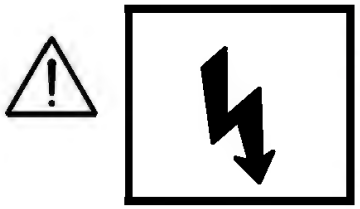
Red	Electric	Green/Brown	Sewer
Yellow	Gas, oil, or petroleum	White	Proposed excavation
Orange	Communication, telephone, TV	Pink	Surveying
Blue	Potable water		

OSHA CFR 29 1926.651 requires that the estimated location of underground utilities be determined before beginning excavation or underground drilling operation. When actual excavation or bore approaches an estimated utility location, the exact location of the underground installation must be determined by a safe, acceptable, and dependable method. If utility cannot be precisely located, it must be shut off by the utility company.

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Striking a Utility

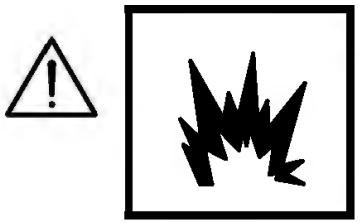
Electricity



DANGER: Electric shock can kill. If strike occurs, stay on machine. Have someone who is clear of the area contact the utility company to shut off electrical power. Do not allow anyone to approach the machine.

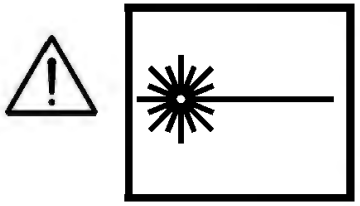
Some circuit breakers automatically reset. Do not assume power has been permanently disconnected until you confirm that the utility company has locked out power to that line.

Gas



DANGER: Gas explosion can kill. If you strike a gas line, shut off engine and evacuate area immediately. Contact utility company and do not return until the utility company gives permission to do so.

Fiber Optic

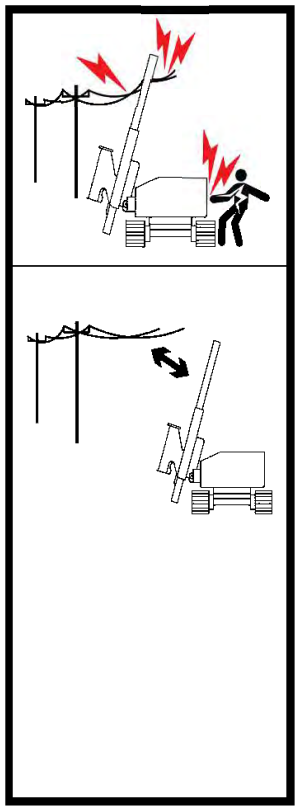


WARNING: Laser light may damage eyes. Do not look into the end. Fiber optic cables carry laser light which may damage your eyes. If you are not sure what kind of cable it is, do not look into the end. Contact appropriate utility company for assistance.

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Electrical Shock Protection



DANGER: Electrocution hazard exists around an energized overhead power line. If equipment gets near or contacts energized overhead power line, all connected equipment and surrounding ground surface will be energized. Death or serious injury will result due to electrocution.

Keep machine away from energized overhead power lines according to chart below.

Voltage, kV	Minimum Clearance Distance, ft (m)
up to 50	10 (3.1)
>50 to 200	15 (4.6)
>200 to 350	20 (6.1)
>350 to 500	25 (7.7)
>500 to 750	35 (10.7)
>750 to 1000	45 (13.8)

If arcing or contact occurs, do the following:

- If on machine, stay on machine. Anyone on ground should shuffle away keeping feet close together and on the ground.
- Contact utility company to shut off electrical power.
- Do not allow anyone to approach the machine or any connected equipment.
- Do not resume operation until utility company declares area safe.

The 10 ft machine reaches a maximum height of 179 in (4.6 m). The 15 ft machine reaches a maximum height of 239 in (6.1 m). The 20 ft machine reaches a maximum height of 299 in (7.6 m). ***Maximum machine height may increase if a compatible third-party GPS system is installed.***

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Electrocution Prevention

Electrocution is possible. Death or serious injury may result if the pile being driven strikes an energized power line. Refer to the operating instructions, and take the following precautions to prevent electrocution:

- Call your One-Call system, and any utility company that does not subscribe to the One-Call system, before your project begins. Locate underground utilities by qualified persons. Refer to *page 40-8.*
- When operation approaches the estimated location of a utility, determine the exact location of the underground installation by safe and acceptable means.
- Never step onto or off the machine if electrical strike occurs. You may hear popping/electrical noises or see smoke or sparks if an electrical strike occurs.

If a strike occurs while you are touching the ground, you could be electrocuted when your body becomes a direct current path to the ground.

Jobsite Assessment

Examine work area for obstructions, conditions, or situations which may impair machine operation or create a safety hazard. Use information in this manual and your own good judgment when identifying these hazards and implementing hazard prevention measures.

Check for steep slopes, banks, overhangs, drop-offs, and trenches, which can cave in.

The operator or job foreman should also inspect the jobsite for:

- Holes, rocks, or other hidden hazards
- Traffic/Site access

Remove any obstacles or materials that could result in injury or damage the machine.

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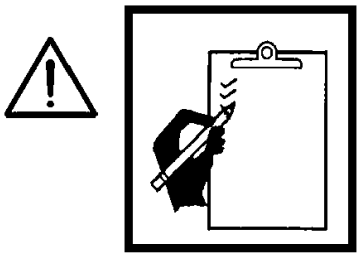
Power Line Locator System

A locator system to locate underground power lines is not included with the system but may be purchased from Vermeer dealerships.

Laws and Regulations – Check

Understand and follow all federal, state, and local laws and regulations that apply to the current job.

Preparing the Machine



WARNING: Check machine before operating. Machine must be in good operating condition and all safety equipment installed and functioning properly.

- Ensure you understand and comply with all jobsite rules that might apply to your work situation.
- Adjust seat for best access to controls.
- If operating along a road, properly alert and divert motor and pedestrian traffic. Use all necessary signs, cones, flag persons, or lighting devices needed for the work situation.
- Clean machine to help ensure good operating condition. Refer to *page 60-66.*

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Preparing the Mast

Machine With 10-ft Mast

Additional steps may be required if a compatible third-party GPS system is installed.

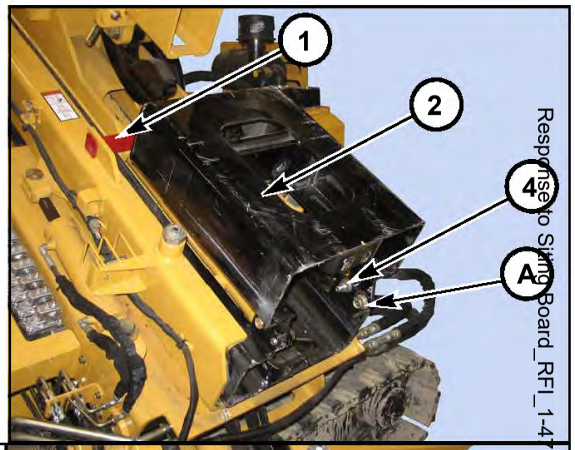
Step 1: Tilt mast to upright position.

Step 2: Lower mast fully.

NOTICE: If mast is raised too high with bottom section folded, lower mast adjusters **(3)** could fall out of holders.

Step 3: Raise hammer.

Step 4: Install hammer support bar **(1)** in bracket.

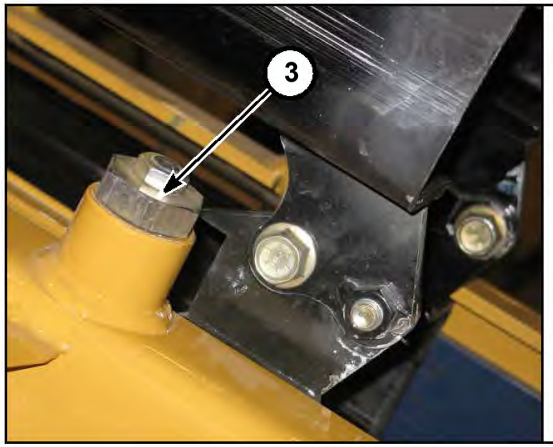


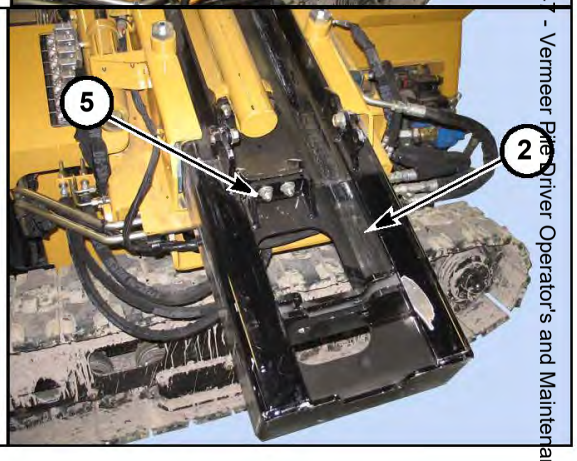
Step 5: Lower hammer to contact hammer support bar.

Step 6: Loosen bolts at hinge **(A)** to allow mast to fold while keeping hinge together.

Step 7: Remove bolts **(4)** and fold down bottom section **(2)**.

Depending on size of guide installed, the hammer may need to be raised slightly for clearance when folding bottom section. Lower hammer to contact support bar before installing bolts in holes **(5)**.





Step 8: Install bolts in holes **(5)** and torque to 212 ft-lb (287 Nm).

Step 9: Torque bolts at hinge to 150 ft-lb (203 Nm).

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Machine With 15-ft Mast

Additional steps may be required if a compatible third-party GPS system is installed.

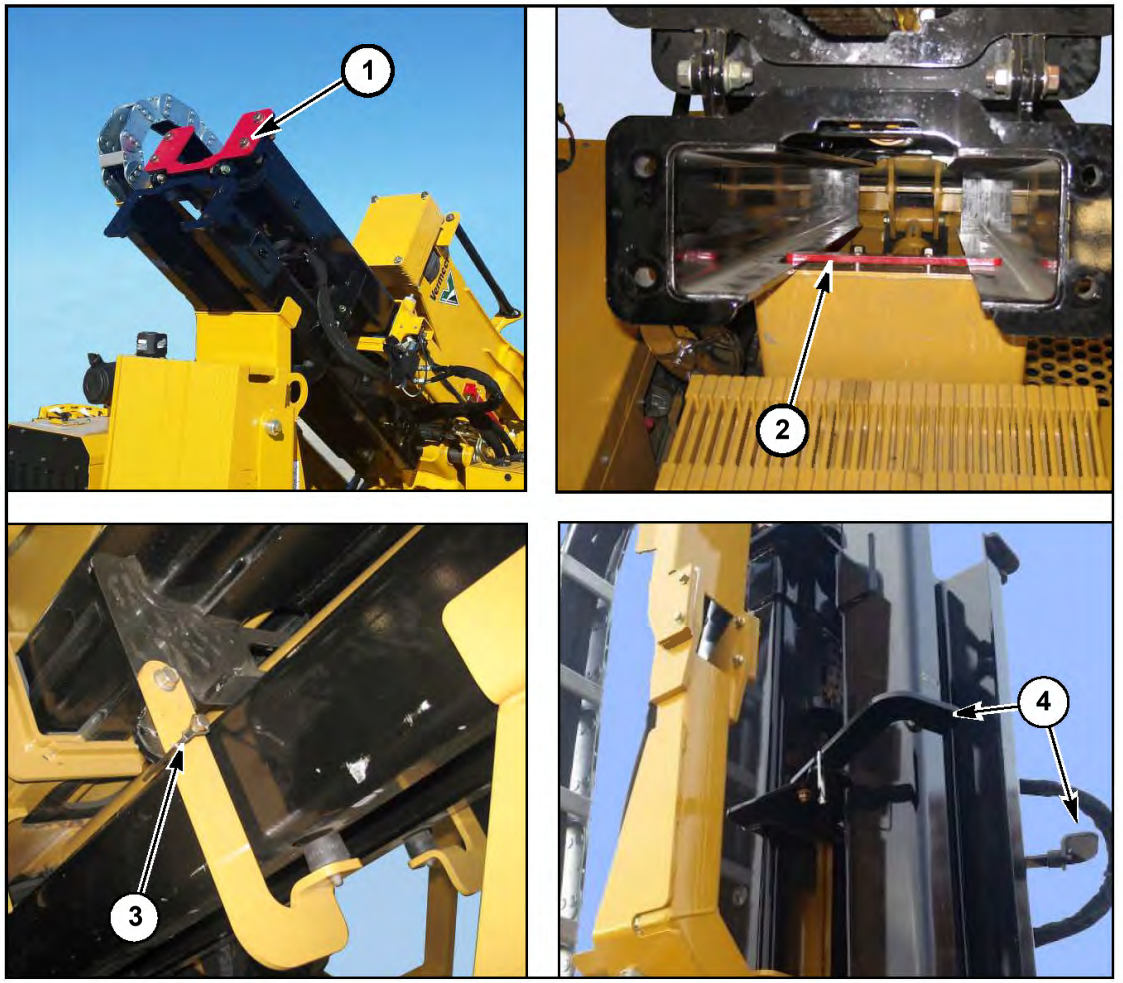
Step 1: Remove four bolts and mast cap plate **(1)**. Retain in toolbox for use during transport.

Step 2: Remove bolts and lock plate **(2)**. Retain in toolbox for use during transport.

Step 3: Tilt mast to the upright position.

Step 4: Remove linchpins **(3)** in locks.

Step 5: Swing out locks **(4)**. Insert linchpins to hold locks open.



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Step 6: Attach suitable lifting device **(5)** to top of mast. Top section of 15-ft mast weighs 190 lb (86 kg).

Step 7: Raise lifting device until top of mast clears cradle **(12)**.

Step 8: Simultaneously tilt mast toward machine and adjust lifting device until hinge is within reach.

Step 9: Insert four longer bolts **(6)** retained in toolbox and tighten. Torque to 376 ft-lb (510 Nm).



Step 10: Remove lifting device.

Step 11: Tilt mast until it is slightly toward machine from vertical.

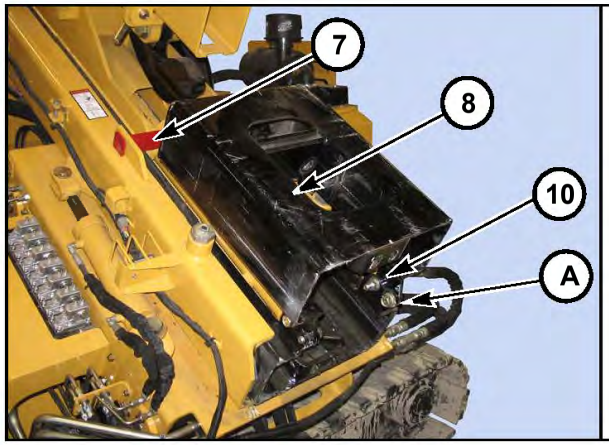
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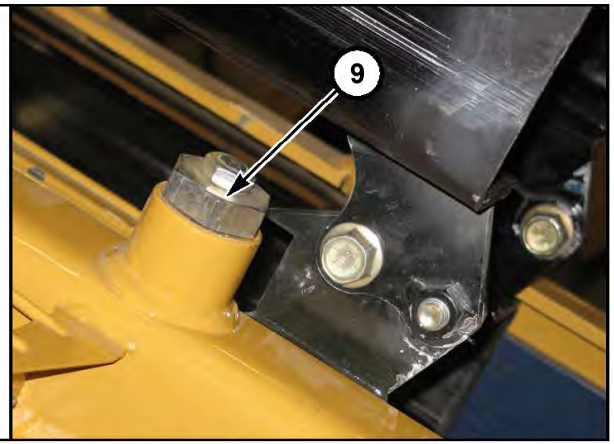
Step 12: Completely lower mast to allow bottom section **(8)** to pivot at hinge **(A)**.

NOTICE: If mast is lifted too high with bottom section folded, lower mast adjusters **(9)** could fall out of holders.

Step 13: Ensure hammer support bar **(7)** is installed.

Step 14: Loosen bolts at hinge to allow mast to fold.



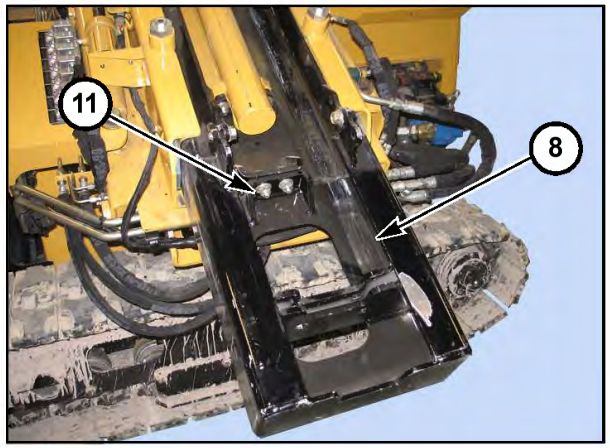


Step 15: Remove bolts **(10)** and unfold bottom section of mast.

Depending on size of guide installed, the hammer may need to be raised slightly for clearance when folding bottom section. Lower hammer to contact support bar before installing bolts in holes **(11)**.

Step 16: Install bolts in holes **(11)** and torque to 212 ft-lb (287 Nm).

Step 17: Torque bolts at hinge to 150 ft-lb (203 Nm).



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Machine With 20-ft Mast

Raise hose carrier if it has been folded for transport. Proceed to Step 5 if hose carrier was not folded.

Step 1: Remove transport straps **(1)**.

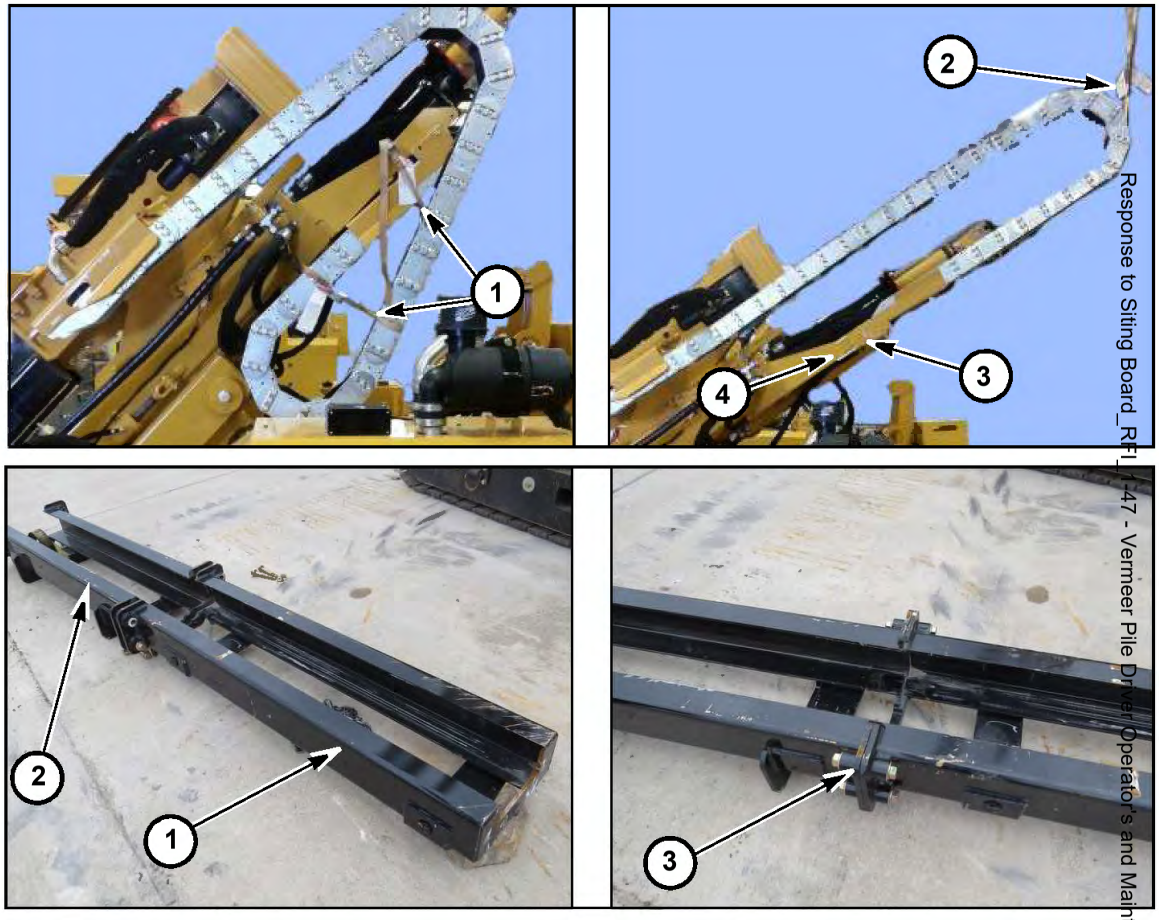
Step 2: Attach suitable lifting device to hose carrier **(2)**. This portion of hose carrier weighs 500 lb (227 kg).

Step 3: Unfold hose carrier.

Step 4: Install bolts **(3)** and tighten bolts **(4)**.

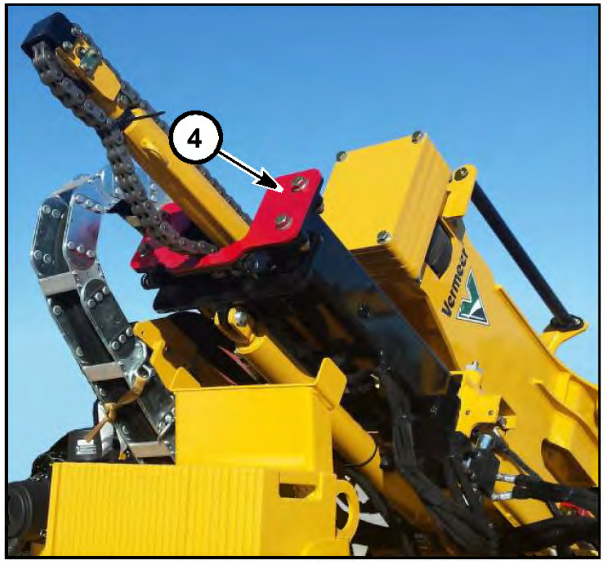
Additional steps may be required if a compatible third-party GPS system is installed.

Step 5: Attach top **(1)** and middle **(2)** portions of mast together. Torque bolts **(3)** to 376 ft-lb (510 Nm).

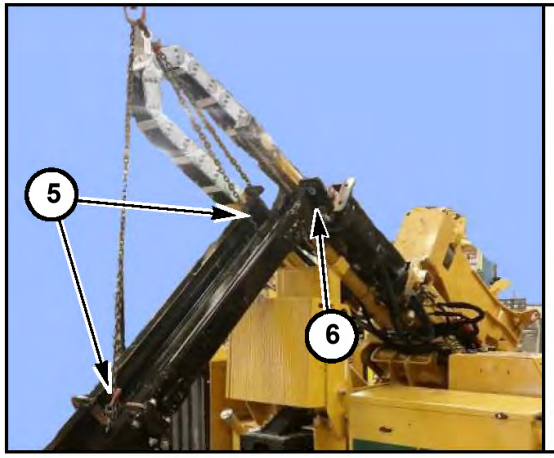


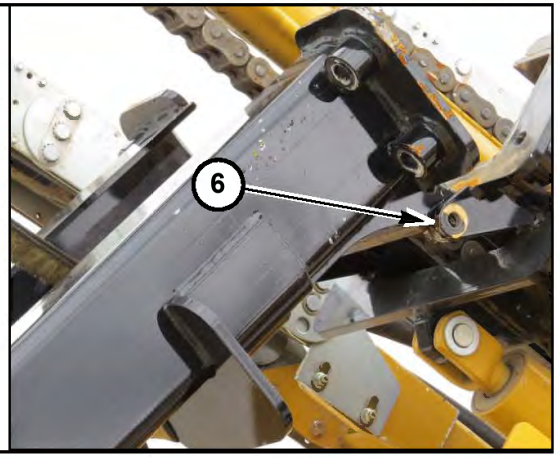
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Step 6: Remove bolts and mast cap plate **(4)** on lower portion of mast. Retain in toolbox for use during transport.



Step 7: Attach suitable lifting device to top two sections of mast at two points **(5)** and align with hinge bolt holes **(6)** on machine. Top two sections of mast weigh 380 lb (172 kg) combined.





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Step 8: Install bolts **(7)** into hinge and tighten to retain joint, but allow mast to unfold.

Step 9: Remove lifting device connection near hinge.

Step 10: Raise top two mast sections to align with bottom section.



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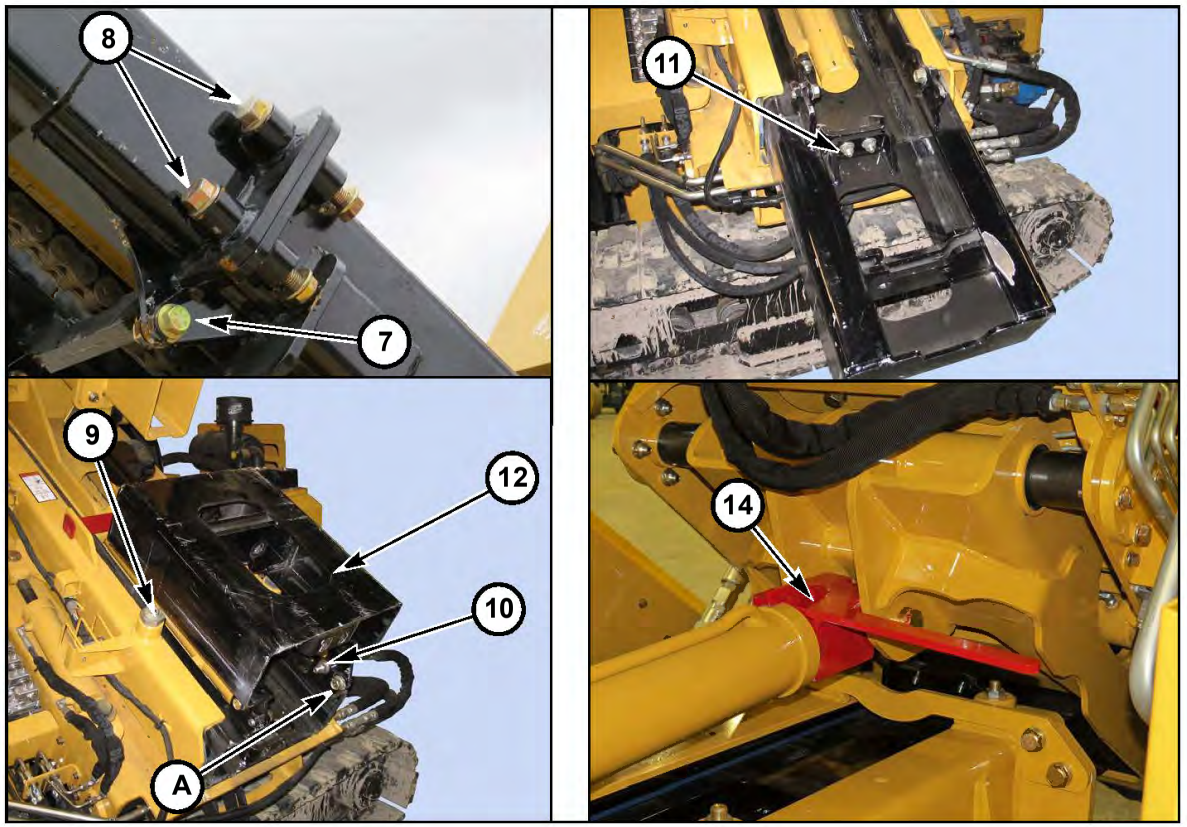
Step 11: Install bolts **(8)**; torque to 376 ft-lb (510 Nm).

Torque bolts **(7)** to 150 ft-lb (203 Nm)

Step 12: Remove lifting device.

Tilt mast out of cradle and away from machine until mast is almost vertical.

NOTICE: If mast is lifted too high with bottom section folded or removed, lower mast adjusters **(9)** could fall out of holders.



Step 13: Ensure hammer support bar is installed.

Step 14: If equipped, remove mast tilt positioner **(14)**, then proceed to step 15.

If not equipped with a mast tilt positioner, proceed to step 18.

Step 15: Loosen bolts at hinge **(A)** to allow bottom section of mast **(12)** to pivot.

Step 16: Remove bolts **(10)** and unfold bottom section of mast

Depending on size of guide installed, hammer may need to be raised slightly for clearance when folding bottom section. Lower hammer to contact support bar before installing bolts in holes **(11)**.

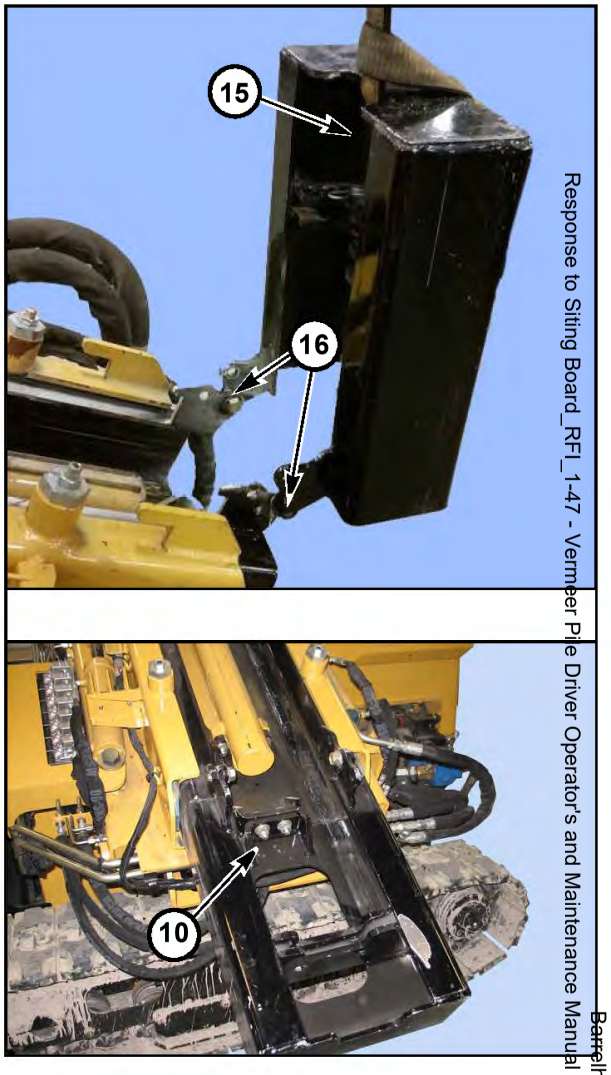
Step 17: Install bolts **(10)** in holes **(11)**, torque to 212 ft-lb (287 Nm).

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Step 18: Attach bottom section of mast:

- Lower mast completely.
- Attach suitable lifting device to bottom section of mast **(15)**. Bottom section weighs 85 lb (39 kg).
- Lift bottom section of mast into position.
- Install bolts **(16)** so that bottom section can pivot.
- Unfold bottom mast section into work position, then tighten bolts and remove lifting device.
- Install bolts **(10)** that were stored during transport. Torque to 212 ft-lb (287 Nm).



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Mounting Compatible Third-party GPS System

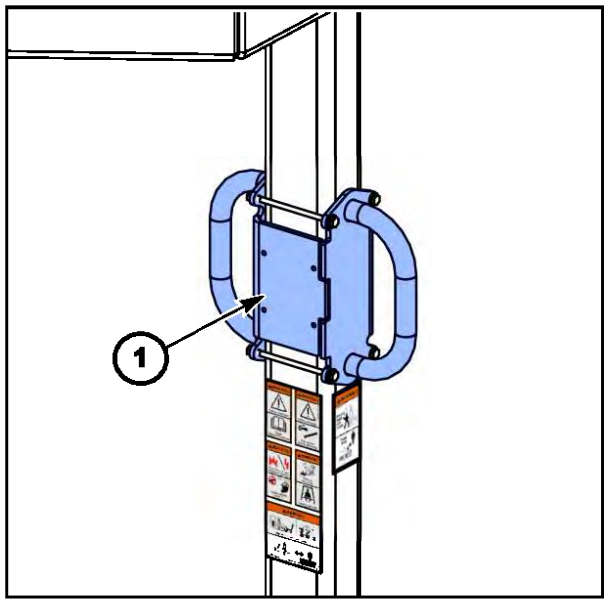
Mounting accommodations have been provided for the owner's convenience in mounting a compatible third-party GPS system. Vermeer makes no representation as to the compatibility of any third-party GPS system.

Display

(1) Mounting location

Mounting location has standard VESA 1/4-20 UNC threaded hole pattern. Use only holes provided to mount display. Do not drill or weld on the ROPS bar. Unauthorized modifications of the ROPS could weaken the structure and reduce protection. Refer to "Rollover Protective Structure (ROPS)," *page 30-3.*

Display must not block operator's view of pile installation process. If necessary, reposition display to rotate operator's station, or to improve walkway access.



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Antenna

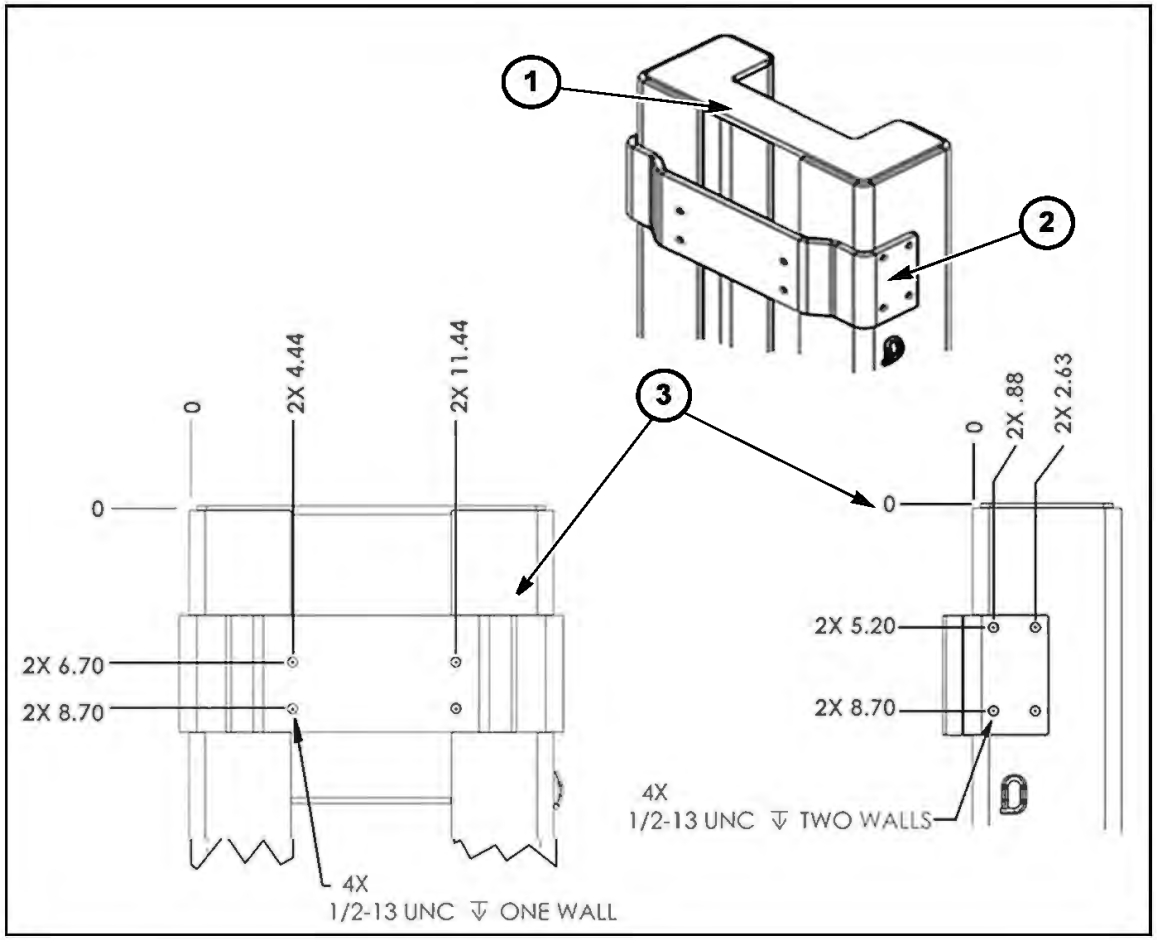
An antenna can be attached to the mast. Refer to compatible third-party GPS Operator's Manual for more information.

(1) Top of mast

(2) Bracket

(3) Bolt hole specifications

NOTICE: Use bolts that will not protrude through mast and interfere with hammer carriage when fully raised.



Compartment

The lockable compartment **(1)** provides a mounting location **(2)** with pre-drilled holes for a receiver or battery, a 12-pin electrical connector **(3)** and storage for components.

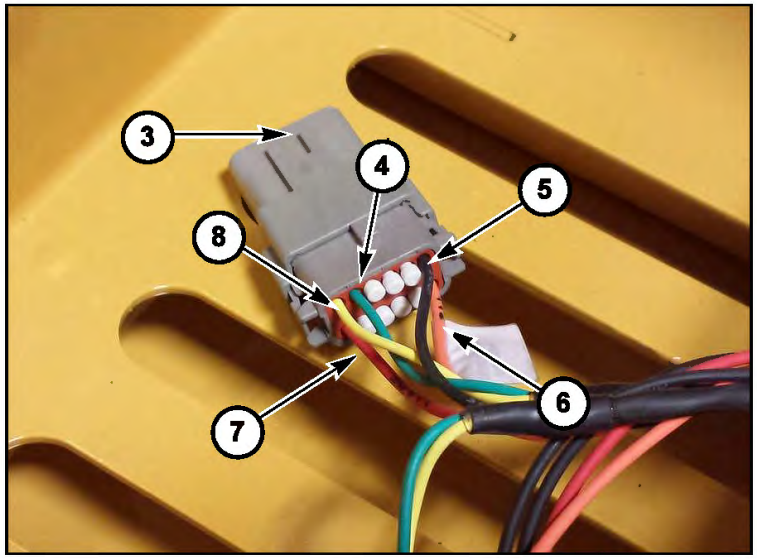
(4) CAN low

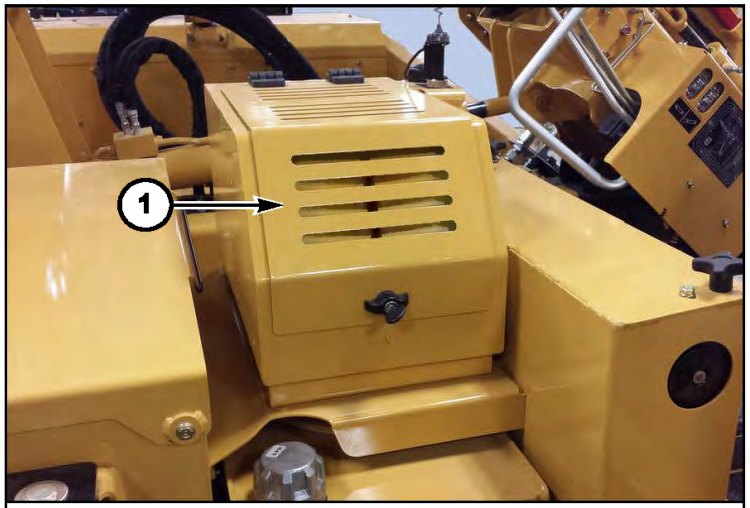
(5) Ground

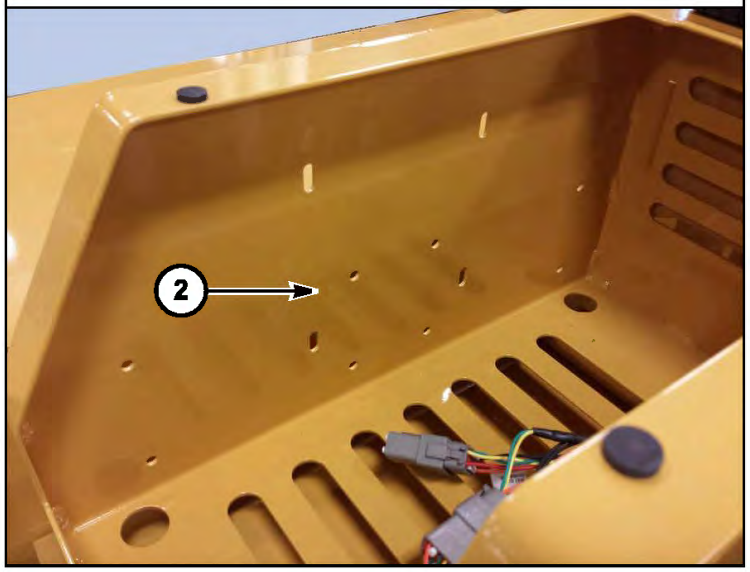
(6) 12V power, switched

(7) 12V power, unswitched

(8) CAN high







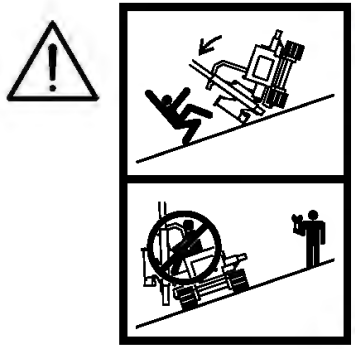
Section 50: Operating the Machine



WARNING: Read Operator's Manual and safety signs, and watch the operations and safety video, before operating machine.

Familiarize yourself with the location and function of the controls before operating. Refer to "Controls," *page 20-1.*

Rollover Possible



WARNING: Rollover can crush.

Stay uphill.

No riding.

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WARNING: Rollover can crush.

Fasten seat belt.

Take precautions to prevent rollover.

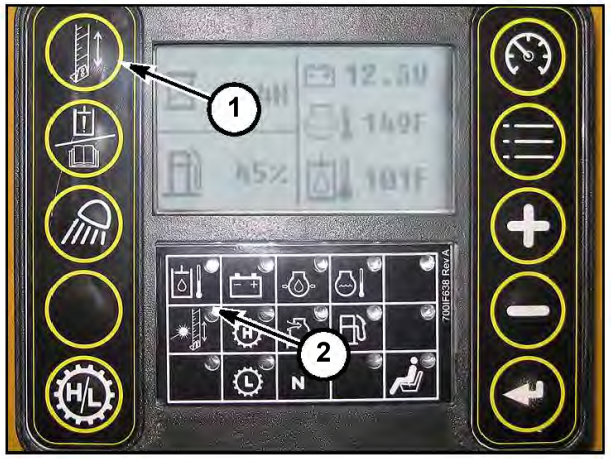
- Do not operate on slopes where rollover could occur.
- Do not operate near large holes, ditches, steep banks, or other terrain that may cause the machine to tip sideways.
- Operate at speeds and in a manner consistent with terrain and operating conditions.
- Before driving or operating machine, survey area around machine for persons or obstacles.

Driving Piles Using Operator's Station

This procedure requires a second person to handle piles.

Step 1: Press *measure mode key* **(1)** to select desired mode based on machine configuration. Refer to "Measure Mode Selections," *page 20-25.*

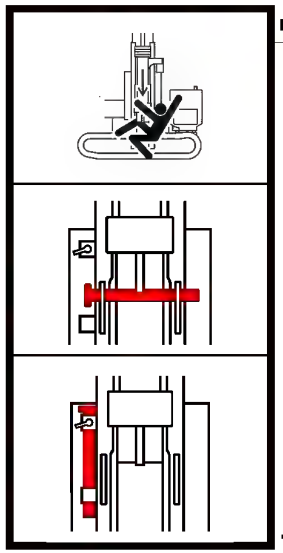
Measure mode light **(2)** will come on when an automatic measure mode is selected.



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Step 2: Tilt mast to vertical with switch **(3)** and joystick. Refer to *page 20-14.*



WARNING: Falling hammer can crush.

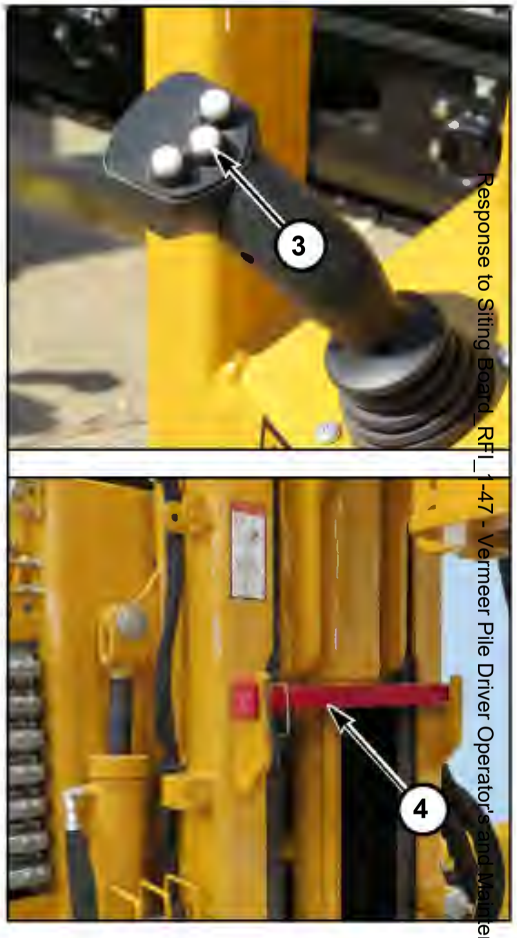
Engage support before working on or under hammer.

Storage

Step 3: Ensure hammer support bar **(4)** is installed and supporting hammer.

Step 4: If necessary, install hammer support bar and lower hammer to contact support bar.

Step 5: Shut down engine and remove key.



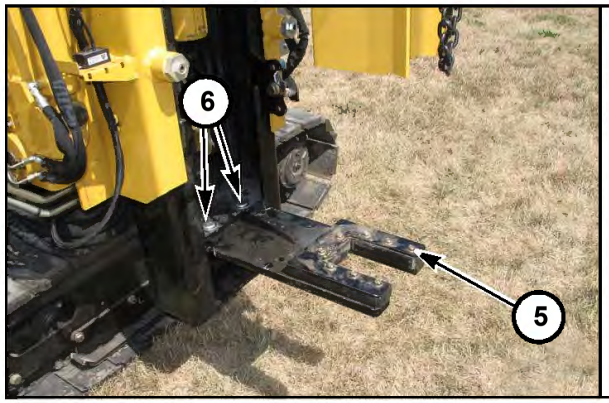
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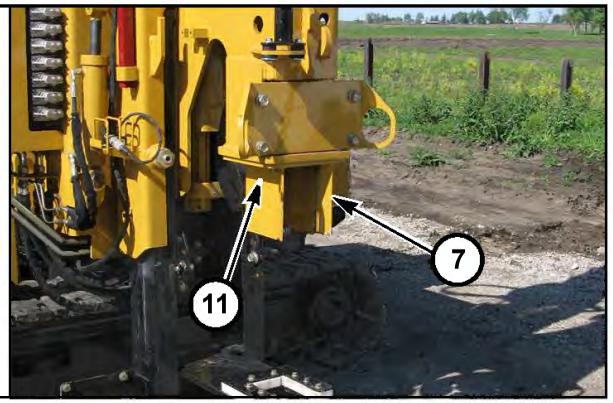
Step 6: Attach lower guide plate **(5)** with pins and hairpins **(6)**.

Step 7: Attach upper guide **(7)** with bolts **(11)**.

Step 8: Follow *Starting Procedure,* page *22-1.*

Step 9: Raise hammer slightly to remove hammer support bar. Stow bar.

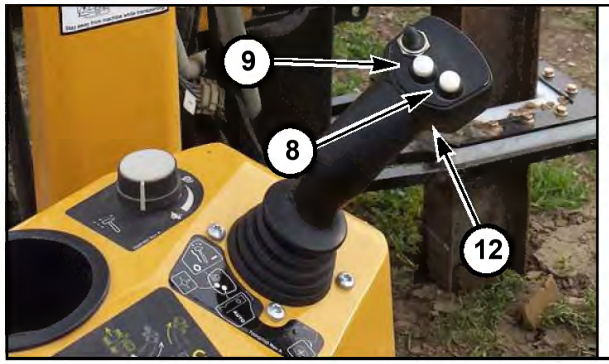


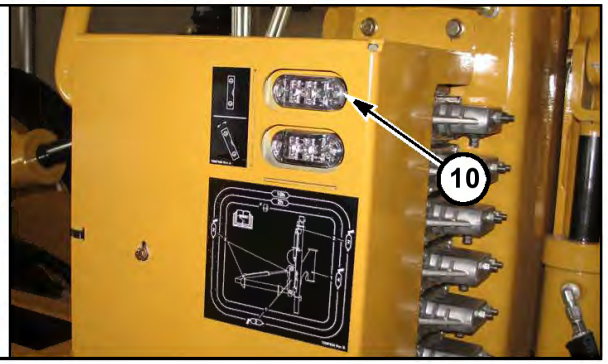


Step 10: Engage auto home mast slide **(9)** (if equipped) to provide a consistent starting point.

Step 11: Position machine and mast. Leave enough mast slide travel to disengage lower guide plate **(5)** from the pile after the pile is driven if side load guide is used.

Guides **(5)** & **(7)** can be changed depending on pile size and shape.





Step 12: Lower hammer on mast.

Step 13: Engage auto plumb **(8)** to fine-tune the mast position.

If green light **(10)** is on, mast is within plumb tolerance range.

Activating auto plumb with hammer raised may make the mast sway, which may result in a slower cycle time. Activating auto plumb with the hammer raised may also decrease machine stability.

Step 14: Engage GPS auto target **(12)**, if equipped with compatible third-party GPS system.

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If using a lifting device to help position pile:

- Select a device that is correct for the type of pile being driven. Consider weight, shape, and material composition.
- Inspect lifting device throughout the day, and repair or clean, as necessary.
- Do not lift the pile overhead or off the ground more than necessary.
- Position pile before lifting so that top end is pointing away from all personnel.
- Attach lifting device above midpoint of pile so that pile is lifted upright to facilitate installation.

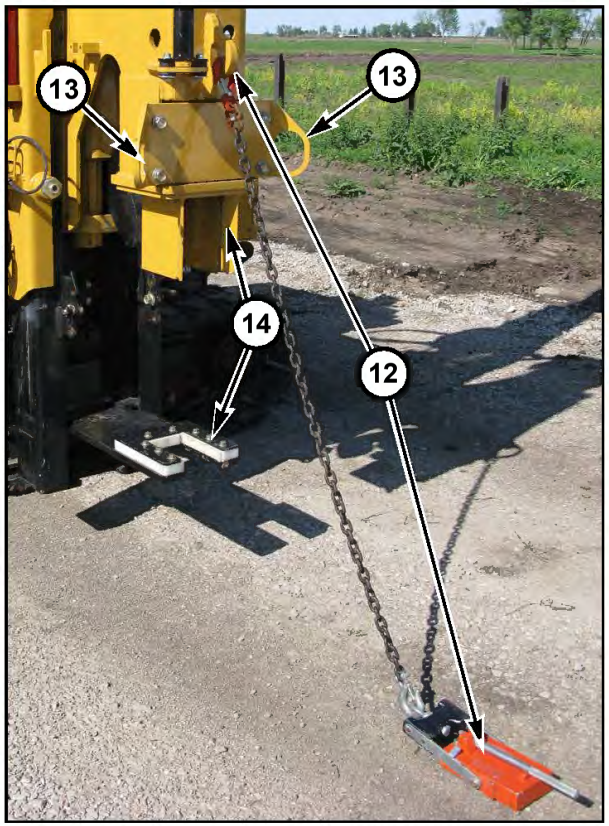
If using a magnet to lift the pile:

- Remember that the magnet will be lifting in shear (reduced capacity). Use only a magnet specifically designed for this type of lifting. Follow magnet manufacturer's instructions for safe lifting.
- The magnet's lifting capability depends on several factors, including pile weight, material type, material thickness, coatings, and cleanliness.
- Pile and magnet must be dry and free of ice, dirt, foliage, and debris. The magnet must be in full contact with the surface of the pile being lifted.

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Step 15: If using a lifting device, attach lifting device **(12)** to pile and location on machine as shown.

Lifting device can be routed through one of the guide loops **(13)** to help direct pile into position. Do not attach lifting device to guide loops.

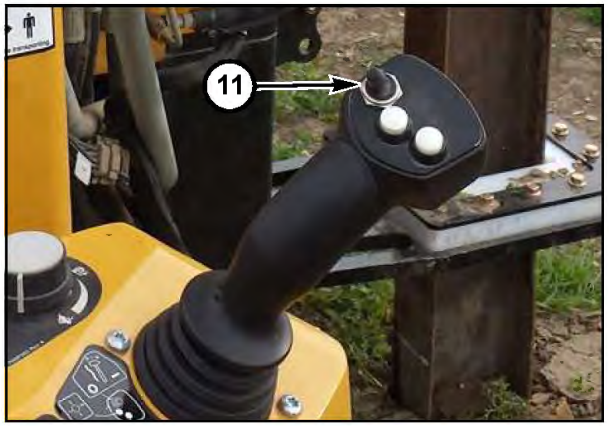


WARNING: Falling loads can result in death or serious injury. Do not exceed rated lift capacity of lifting device.

Step 16: Raise hammer by pulling back on right joystick, while second person helps guide pile into position.

Step 17: Insert pile into upper and lower guides **(14)**.

Step 18: Slowly lower hammer onto the pile, and turn hammer FLOAT on with switch **(11)**.



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Step 19: Start hammer with *hammer on/off switch* **(12)** on back of right joystick.

- If using a measure mode with elevation, and a laser receiver or compatible third-party GPS system with an elevation component is installed and functional, hammer blows stop when hammer reaches the preset elevation.
- If using a manual measure mode, press *switch* **(12)** again to stop hammer when correct height is reached.

Step 20: If necessary to prevent interference, remove lifting device before pile is fully driven.

Step 21: If a single strike is needed, adjust *dial* **(13)** to lower hammer speed. Start with 50% until you are more experienced.

Step 22: Press and hold *switch* **(15)** until hammer strike occurs.

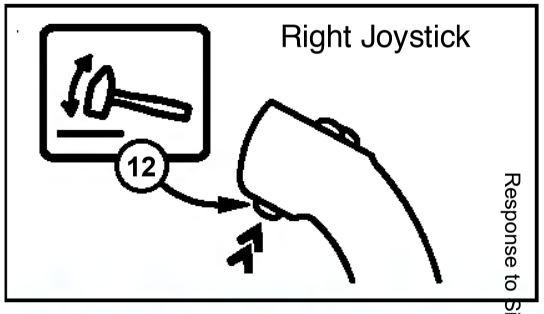
Step 23: Disengage hammer float with *switch* **(11)**.

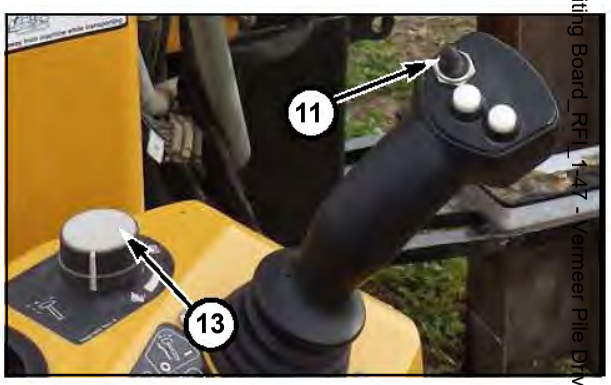
Step 24: If necessary, remove lifting device from pile and step away from machine.

Step 25: When pile reaches desired height, lift hammer high enough to clear pile.

Step 26: If using side load guide, slide mast toward machine until lower guide is clear of pile.

Step 27: Move machine to next position.

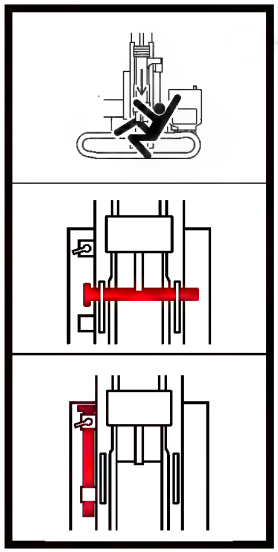






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Extracting Piles Using Operator's Station



WARNING: Falling hammer can crush.

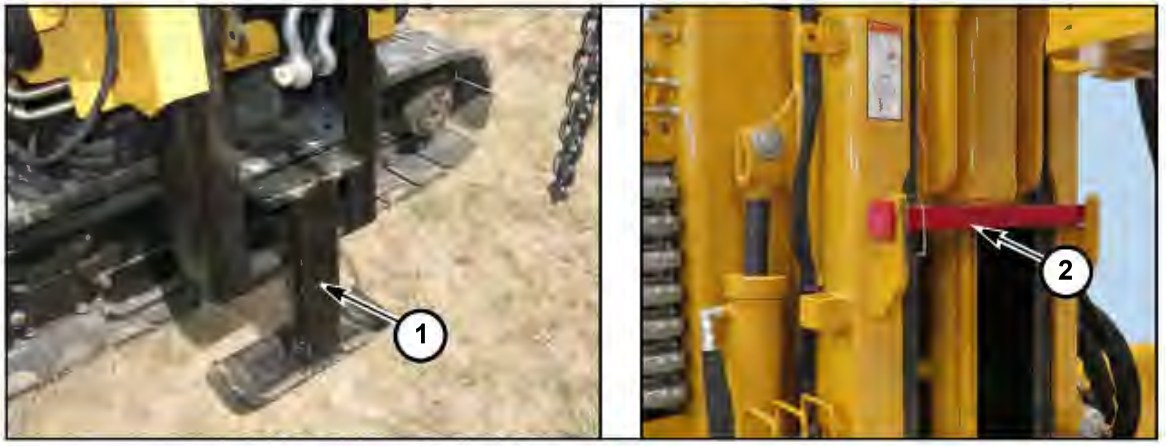
Engage support before working on or under hammer.

Storage

Step 1: Adjust mast height and hammer height so that extraction foot **(1)** and hammer support **(2)** can be installed.

Step 2: Install hammer support bar **(2)** and lower hammer onto bar.

Step 3: Shut down engine and remove key.



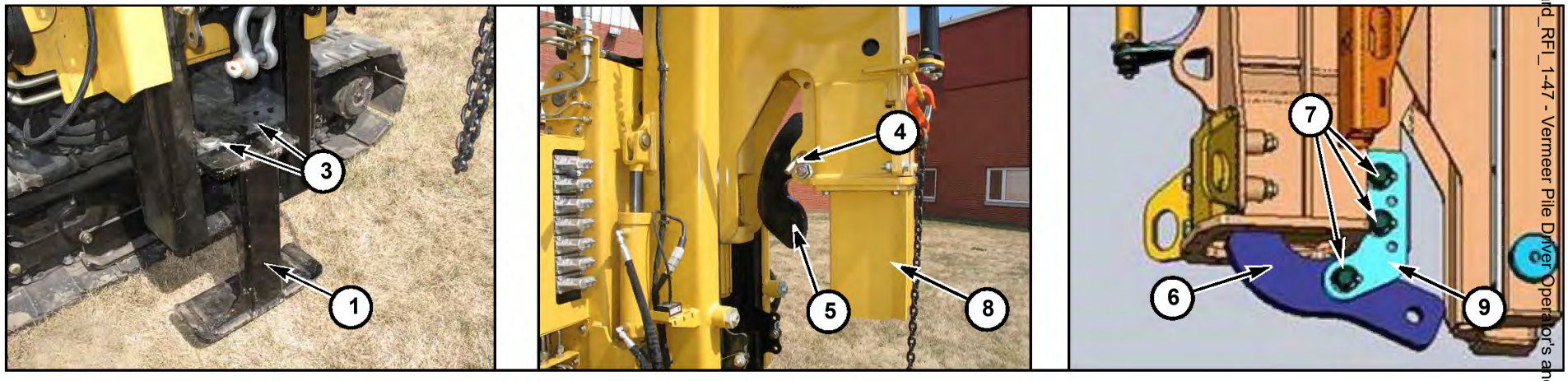
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Step 4: Install extraction foot **(1)** and secure with pins **(3)**.

WARNING: Plate **(5)** is heavy and will swing down when pin **(4)** is removed. Keep hand away from leading edge of plate when removing pins, or crushing injury may result.

Step 5: **Smaller opening hammer box:** Remove linchpin and pull pin **(4)** to allow plate **(5)** to swing down to position shown in center photo. Store pin **(4)** in same hole.

Larger opening hammer box: Remove upper guide **(8)**. Install plate **(6)** and bracket **(9)** (stored in toolbox) with pins **(7)**. Secure pins with quick release pins.



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Step 6: Insert shackle **(10)** with clamp **(11)** (or other appropriate coupling device) into plate **(5)**.

Shackles bear significant shock loading due to impact. Use correctly sized shackles. Shackles and clamp are not provided. Appropriate clamping device varies, depending on pile type, size, and shape.

Step 7: Follow *Starting Procedure,* page *22-1.*

Step 8: Raise hammer slightly to remove hammer support bar. Stow bar.

Step 9: Position clamp above pile.

Step 10: Lower mast until extraction foot touches the ground.

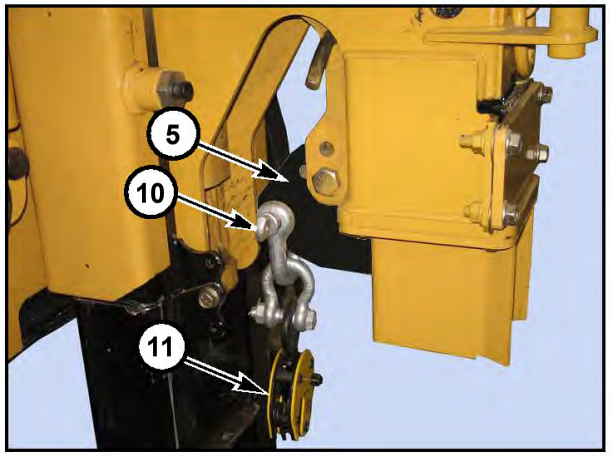
Step 11: Lower hammer until clamp can attach to top of pile.

Step 12: Shut down engine and remove key.

Step 13: Attach clamp to pile.

Step 14: Follow *Starting Procedure,* page *22-1.*

Step 15: Slowly lift hammer until clamp locks onto pile and is tensioned.



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Step 16: Slowly lift hammer by pulling on right joystick.

Step 17: Activate the hammer with *momentary hammer engage switch* **(12)**.

Step 18: Stop hammer percussion when pile becomes easy to extract, and continue to extract with hammer lift.

Step 19: Tilt pile away from all personnel and lower hammer until pile is on the ground.

- If pile is light enough, the ground crew can assist with lower end of the pile as hammer is lowered.
- If pile is too heavy or very long, drive the machine rearward so the top of the pile is lowered away from the operator. Always drive machine in direction that prevents piles from lowering towards personnel.

Step 20: Remove clamp.

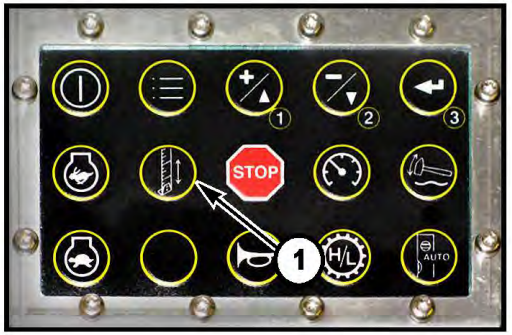


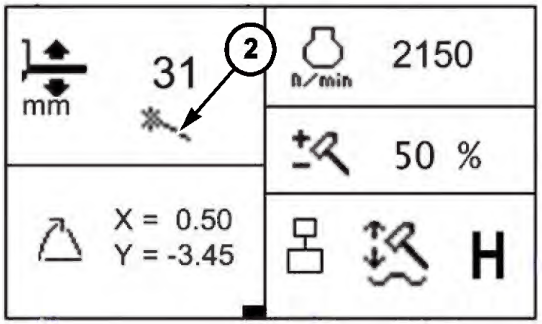
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Driving Piles Using Remote Control (Option)

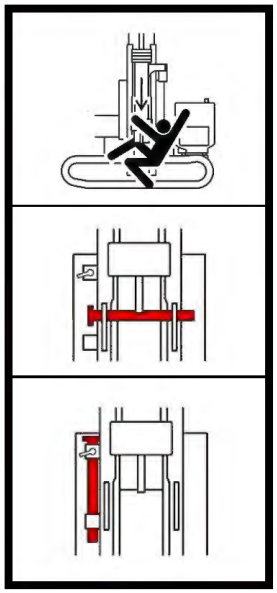
Step 1: Press *measure mode key* **(1)** to select desired mode based on machine configuration. A symbol **(2)** will appear on screen (varies by measure mode selected).

Step 2: Tilt mast to vertical with key **(3)** and joystick **(4)**.









WARNING: Falling hammer can crush.

Engage support before working on or under hammer.

Storage position.

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Step 3: Tilt mast to vertical with key **(3)** and joystick **(4)**. Adjust hammer height with right joystick so hammer support bar **(5)** can be installed.

Step 4: Install hammer support bar **(5)** and lower hammer to contact bar.

Step 5: Shut down engine and remove key.

Step 6: Attach lower guide plate **(6)** with pins and hairpins **(7)**.

Step 7: Attach upper guide **(8)** with bolts **(9)**.

Step 8: Follow *Starting Procedure,* page *22-1.*

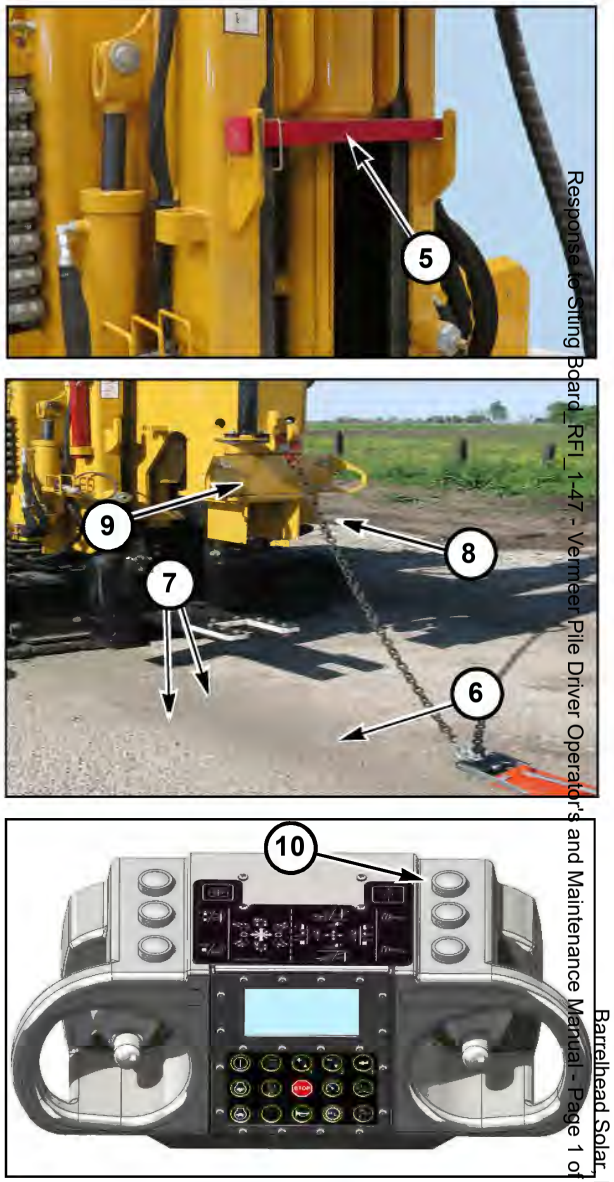
Step 9: Raise hammer slightly to remove hammer support bar. Stow bar.

Step 10: Engage auto home mast slide **(10)** (if equipped) to provide a consistent starting point.

Step 11: Position machine and mast. Leave enough mast slide travel to disengage lower guide **(6)** from the pile after the pile is driven.

Upper guide and lower guide can be changed depending on pile size and shape.

Step 12: Lower hammer on mast.



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Step 13: Engage auto plumb **(11)** to fine-tune mast position.

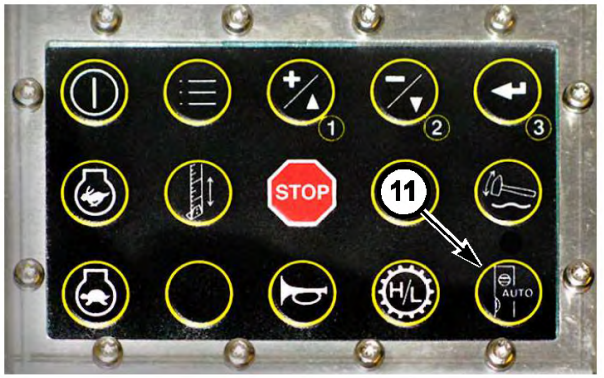
When green light **(12)** is on, mast is within plumb tolerance range. Refer to "Mast Plumb Lights," *page 20-17.*

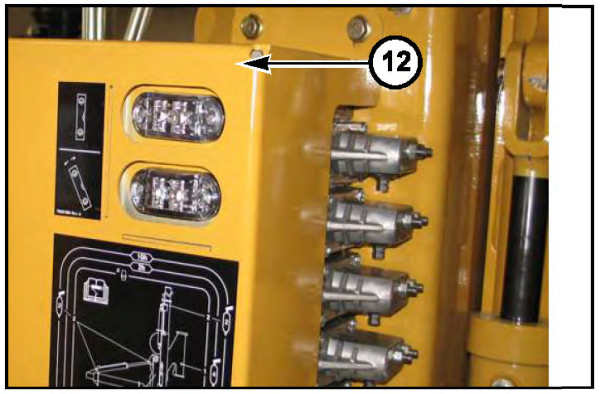
NOTICE: Activating auto plumb with hammer raised may make the mast sway, which may result in a slower cycle time. Activating auto plumb with the hammer raised may also decrease machine stability.

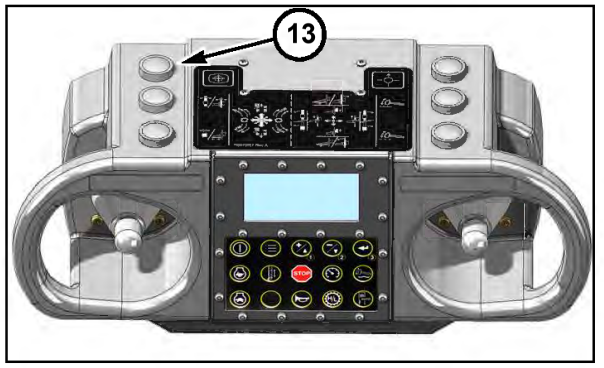
Step 14: Engage GPS auto target **(13)** (if equipped with a compatible third-party GPS system).

If using a lifting device to help position pile:

- Select a device that is correct for the type of pile being driven. Consider weight, shape and material composition.
- Inspect lifting device throughout the day and repair or clean, as necessary.
- Do not lift the pile overhead or off the ground higher than necessary.
- Position pile before lifting so that top end is pointing away from all personnel.
- Attach lifting device above midpoint of pile so that pile is lifted upright to facilitate installation.







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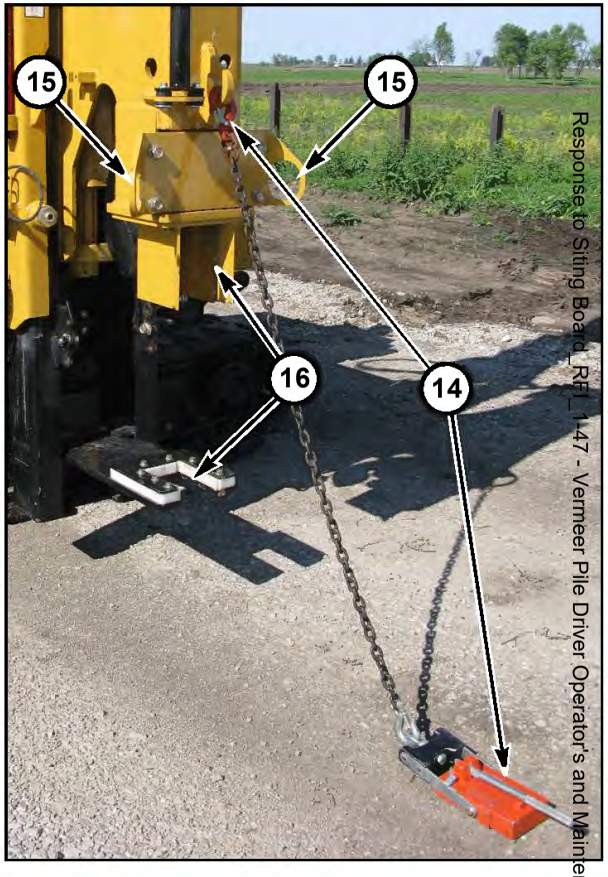
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If using a magnet to lift the pile:

- Remember that the magnet will be lifting in shear (reduced capacity). Use only a magnet specifically designed for this type of lifting. Be sure to follow magnet manufacturer's instructions for safe lifting.
- The magnet's lifting capability depends on several factors, including pile weight, material type, material thickness, coatings, and cleanliness.
- Pile and magnet must be dry and free of ice, dirt, foliage, and debris. The magnet must be in full contact with the surface of the pile being lifted.

Step 15: If a lifting device is being used, attach lifting device **(14)** to pile and location on machine as shown.

Lifting device can be routed through one of the guide loops **(15)** to help direct pile into position. Do not attach lifting device to guide loops.



WARNING: Falling loads can result in death or serious injury. Do not exceed rated lift capacity of lifting device.

Step 16: Raise hammer by pulling back on right joystick, while second person helps guide pile into position.

Step 17: Insert pile into upper and lower guides **(16)**.

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Step 18: Slowly lower hammer onto the pile and turn *hammer float key* **(17)** ON.

Step 19: Start the hammer with *hammer on/off button* **(18)**.

- If using a measure mode with elevation and a laser receiver or compatible third-party GPS system with an elevation component is installed and functional, the hammer blows stop when it reaches the preset elevation.
- If using a manual measure mode, press key **(19)** again to stop hammer when correct height is reached.
- The main screen displays percent of hammer speed. Refer to “Main Screen,” *page 20-24.*

Step 20: If necessary to prevent interference, remove lifting device before pile is fully driven.

Step 21: If a single strike is needed, adjust *hammer speed dial* **(20)** to lower hammer speed. Start with 50% until you are more experienced.

Step 22: Press and hold button **(21)** until hammer strike occurs.

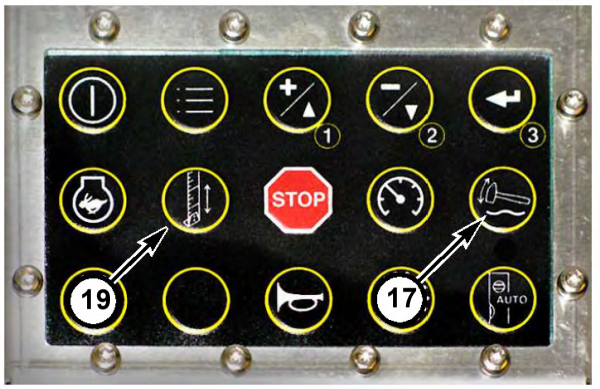
Step 23: Disengage hammer float with key **(17)**.

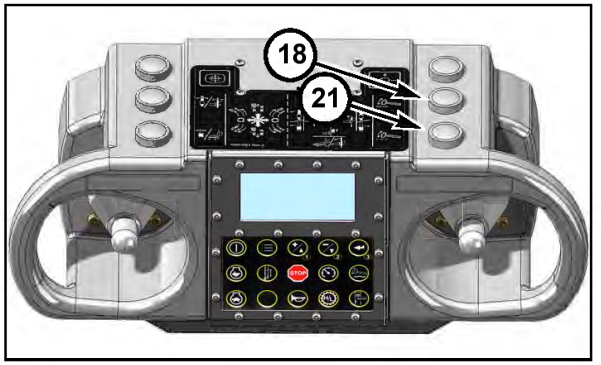
Step 24: If necessary, remove lifting device from pile and step away from the machine.

Step 25: Lift hammer high enough to clear pile.

Step 26: If using side load guide, slide mast toward machine until lower guide is clear of pile.

Step 27: Move machine to next position.

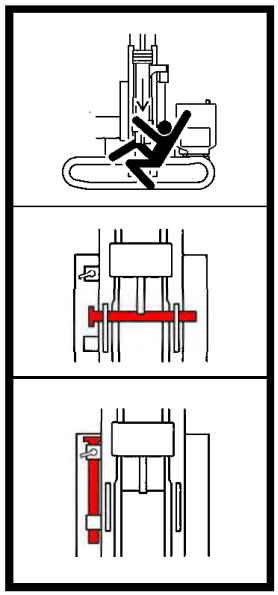






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Extracting Piles Using Remote Control (Option)



WARNING: Falling hammer can crush.

Engage support before working on or under hammer.

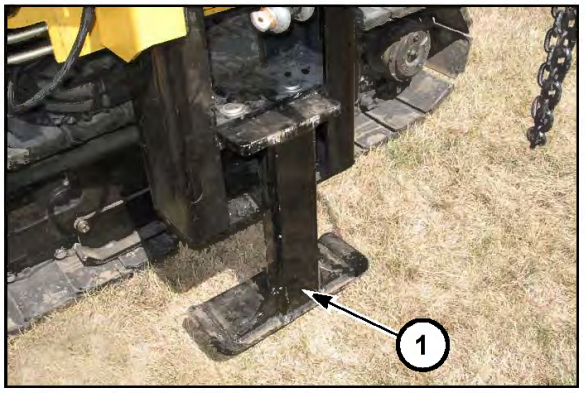
Storage position.

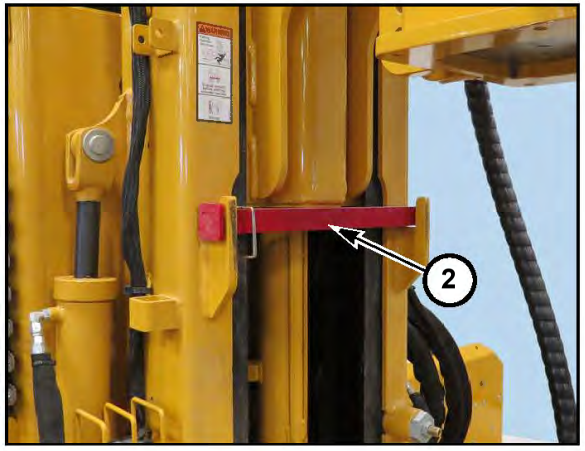
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Step 1: Adjust mast height and hammer height so extraction foot **(1)** and hammer support bar **(2)** can be installed.

Step 2: Install hammer support bar **(2)** and slowly lower hammer onto bar.

Step 3: Shut down engine and remove key.





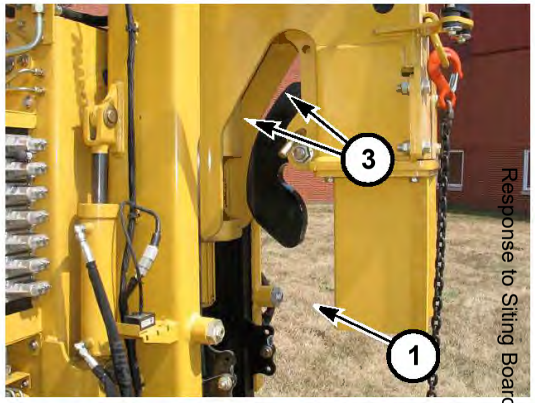
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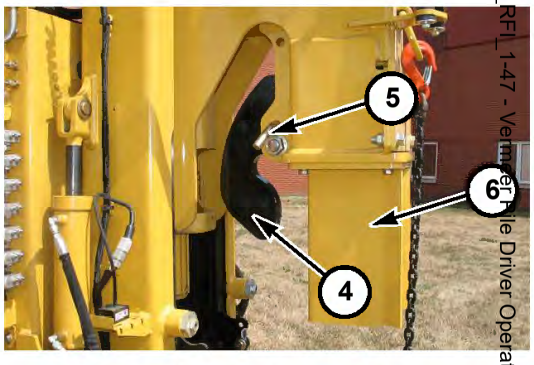
Step 4: Install extraction foot **(1)** and secure with pins **(3)**.

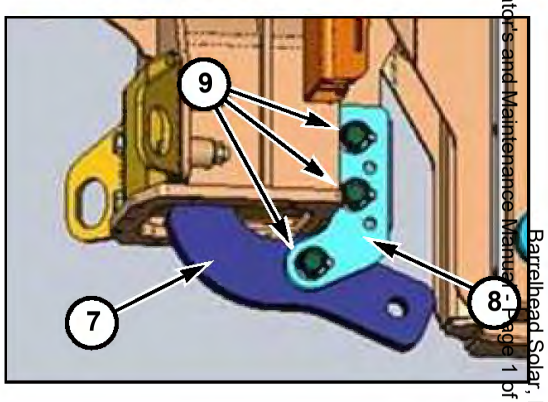
WARNING: Plate **(4)** is heavy and will swing down when pin **(5)** is removed. Keep hand away from leading edge of plate when removing pins, or crushing injury may result.

Step 5: **Smaller opening hammer box:** Remove linchpin and pull pin **(5)** to allow plate **(4)** to swing down to position shown in center photo. Store pin in same hole.

Larger opening hammer box: Remove upper guide **(6)**. Install plate **(7)** and bracket **(8)** (stored in toolbox) with pins **(9)**. Secure pins with quick-release pins.







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Step 6: Insert shackle **(10)** with clamp **(11)** into plate **(12)**.

Shackles experience significant shock loading due to impact. Use correctly sized shackles. Shackles and clamp are not provided. Appropriate clamping device varies, depending on pile type, size, and shape.

Step 7: Follow *Starting Procedure,* page *22-1.*

Step 8: Raise hammer slightly to remove hammer support bar. Stow bar.

Step 9: Position clamp above pile.

Step 10: Lower mast until extraction foot touches the ground.

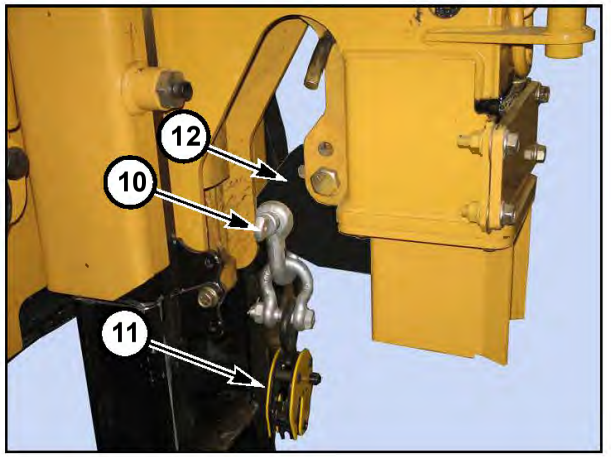
Step 11: Lower hammer until clamp can attach to top of pile.

Step 12: Shut down engine and remove key.

Step 13: Attach clamp to pile.

Step 14: Follow *Starting Procedure,* page *22-1.*

Step 15: Slowly lift hammer until clamp locks onto pile and is tensioned.



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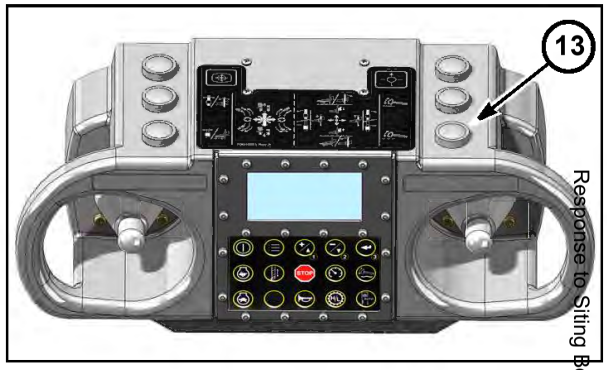
Step 16: Slowly lift hammer by pulling on right joystick. Activate the hammer with the *hammer momentary on button* **(13)**.

Step 17: Stop hammer percussion when pile becomes easy to extract, and continue to extract with hammer lift.

Step 18: Tilt pile away from all personnel and lower hammer until pile is on ground.

- If pile is light enough, the ground crew can assist with moving lower end of pile as hammer is lowered.
- If pile is too heavy or very long, drive machine rearward so top of pile is lowered away from operator. Always drive machine in direction that prevents pile from lowering toward personnel.

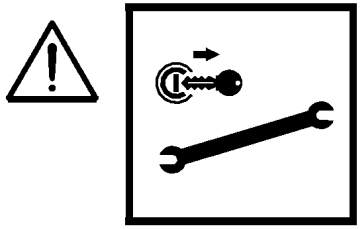
Step 19: Remove clamp.



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Section 60: Maintenance



WARNING: Failure to use shutdown procedure can result in unexpected hazard(s). Death or serious injury could result due to entanglement, crushing, cutting, or other hazardous contact. Follow Shutdown Procedure after operating, before performing any service or maintenance, and before transporting. Refer to *Shutdown Procedure, page 23-1*.

Visually inspect machine daily before starting the machine.

Make no modifications to your equipment unless specifically recommended or requested by Vermeer Corporation.

Properly maintain condition of all safety signs. Refer to *page 60-23.*

Avoid damaging components when cleaning machine. Refer to *page 60-66.*

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Welding Alert – Electronic Components

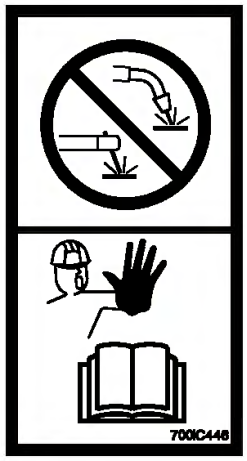
NOTICE: Electronic modules and controllers will be damaged from stray voltages and currents generated during welding if not unplugged ***before welding***.

To prevent extensive and costly damage to the electrical components:

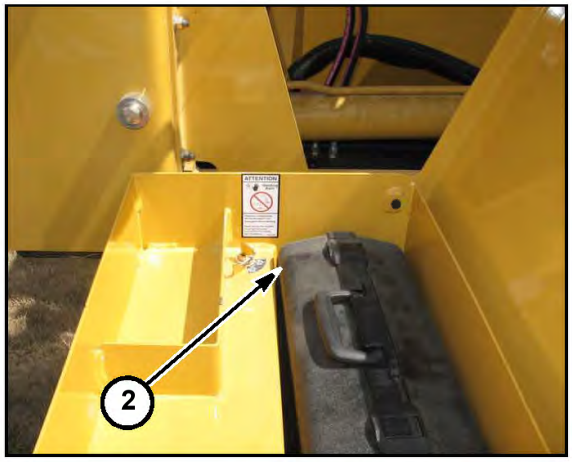
Step 1: Follow *Shutdown Procedure,* page *23-1.*

NOTICE: Wait 60 seconds before disconnecting the battery. This is necessary to allow electronic controllers to complete their respective cycles.

Step 2: Open toolbox **(1)** to access *battery disconnect switch* **(2)**. Turn switch to disconnect.







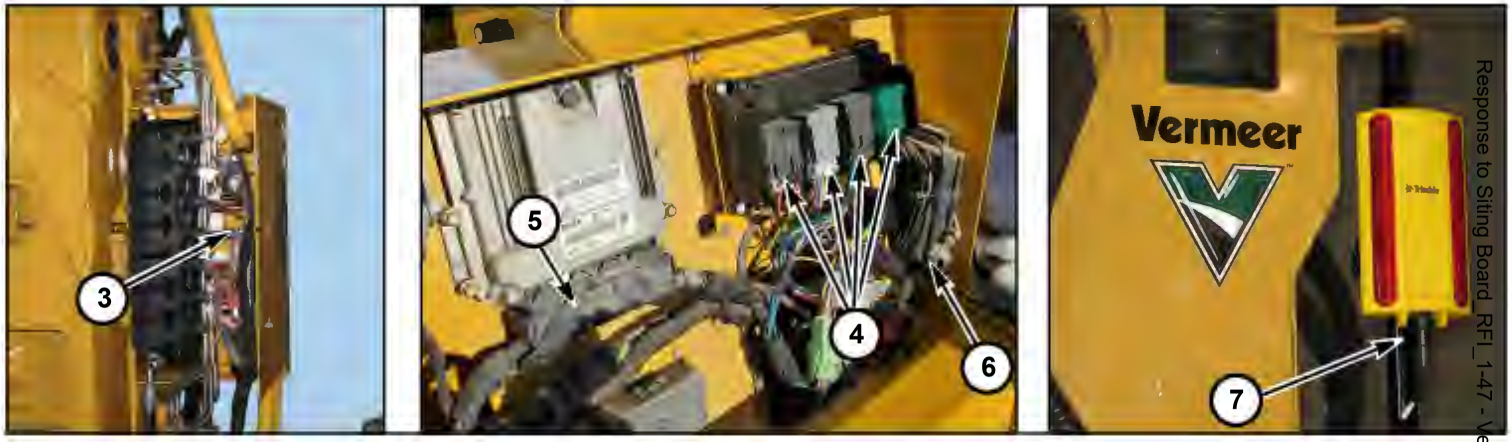
NOTICE: Disconnecting the battery ground with the battery disconnect switch does not prevent damage to the electronic components during welding. Each of the modules must have the electrical connector unplugged.

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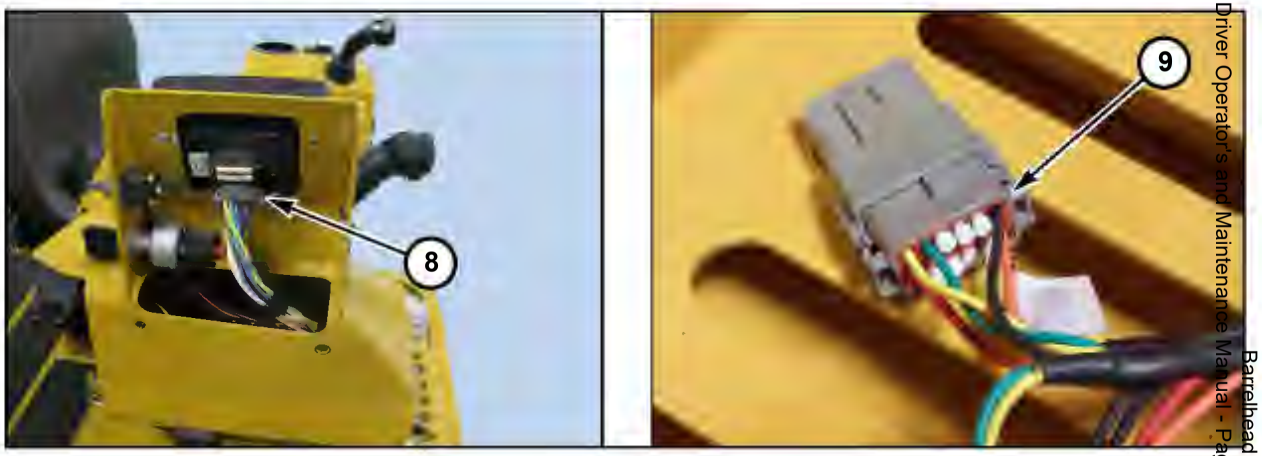
Step 3: Unplug Sauer Plus 1 output module **(3)**, MC4-24-20 module **(4)**, ECU **(5)**, and if equipped, radio remote base **(6)**.

Step 4: If equipped, unplug laser receiver **(7)**.



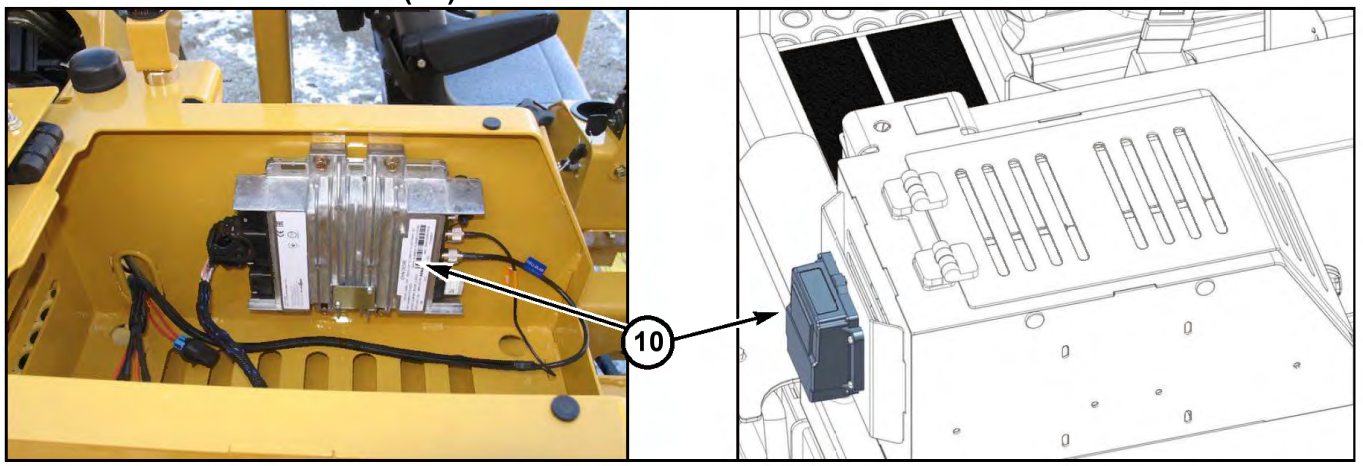
Step 5: Unplug DP10 controller **(8)**.

Step 6: If equipped, unplug compatible third-party GPS connection **(9)**.



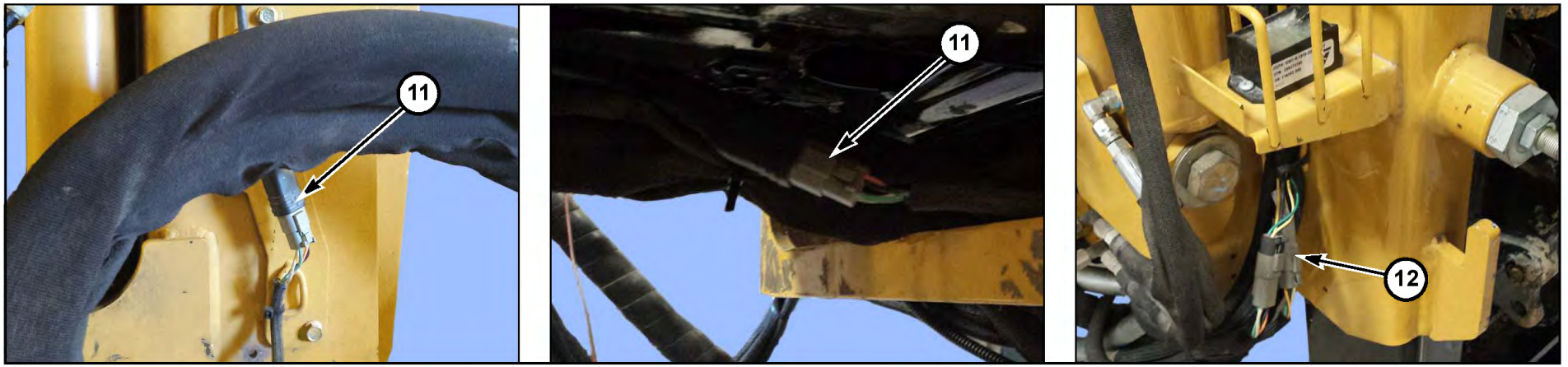
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Step 7: If equipped, unplug telematics control unit connections **(10)**.



Step 8: If equipped, unplug two LVDT sensors **(11)**, and inclinometer connection **(12)**.

Two connections for inclinometer shown. Some machines may be configured with only one inclinometer connection. All inclinometer connections need to be unplugged, regardless of configuration, before welding.



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Engine Maintenance Intervals

Refer to the Engine Operation Manual, supplied with each machine, for maintenance instructions that are not included in this manual. Shorten maintenance intervals when operating under dusty, dirty conditions.

Greasing the Machine

Grease machine after it is shut down for the day. This protects the metal under the seals from corrosion caused by condensation as the temperature drops.

Ensure all fittings and grease applicator nozzle are clean before applying grease. If any grease fittings are missing, replace them immediately.

Recommended Fluids

Refer to “Lubricants,” *page 70-1*, for fluid and lubricant requirements.

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Maintenance Intervals – Hourmeter

The engine display screen is used to determine maintenance intervals for the machine. The display indicates the total number of hours the engine has been in operation. Refer to “Engine Screen,” *page 20-26.*

The maintenance intervals outlined in these maintenance sections are based on normal operating conditions. When operating under severe conditions, shorten the intervals.

Initial = Initial maintenance on new machine. Regular maintenance intervals may be different.

I = Regular maintenance interval.

For Vermeer maintenance replacement part numbers, refer to the parts manual or call your Vermeer dealer.

Service	Maintenance Interval – Service Hours									
	10 or Daily	50 or Weekly	125	250	500	750	1000	1500	2000	As Required
Hammer Point – Grease	●									
Hammer Lift Rollers – Grease	●									
Hammer Lift Roller Nuts and Bolts – Check	●									
Engine – Check for Leaks and Damaged or Missing Parts	●									
Electrical and Hydraulic Components – Check	●									
Engine Oil Level – Check	●									
Hydraulic Oil Level – Check	●									
Coolant Level – Check	●									
Fuel Tank – Fill	●									
Fuel/Water Separator – Check/drain	●									
Mast Tilt Cylinder – Grease	●									
Air Cleaner Restriction Indicator – Check	●									
Wear Pads – Check		●								

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Service	Maintenance Interval – Service Hours									
	10 or Daily	50 or Weekly	125	250	500	750	1000	1500	2000	As Required
Track Planetary Gearbox Oil Level – Check		●								
Safety Signs Maintenance			●							
Overall Machine – Check			●							
Backup Alarm – Check			●							
Controls – Check			●							
Neutral Start Interlock – Check			●							
Indicator Lights – Check			●							
Operator Presence System – Check			●							
Park Brake – Check			●							
Seat Belt Maintenance			●							
Hydraulic System – Check			●							
Hammer Proximity Switches – Check			●							
Ground Drive System – Inspect			●							
Remote Control – Test			●							
Track Pads and Bolt Tension – Check			●							
Track Chain Tension – Check			●							
Percussion Hammer Lifting Chain, Anchor, and Pins – Check/Clean/Lubricate			●							
Engine Oil and Filter – Change				●						
Radiator and Oil Cooler – Clean				●						
Cooling Fan V-belt – Check/Adjust Tension				●						
Governor Lever and Engine Speed Control – Check **(Yanmar Engines Only)**				●						
Hydraulic Filters – Replace (Initial)				Initial						

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Service	Maintenance Interval – Service Hours									
	10 or Daily	50 or Weekly	125	250	500	750	1000	1500	2000	As Required
Fuel Filters – Replace					●					
Primary Air Cleaner Element – Replace					●					
Hydraulic Filters – Replace					●					
Battery Cables and Connections – Check					●					
Battery Connections – Clean					●					
Battery Electrolyte Level – Check					●					
Chain – Inspect					●					
Blunt Tool/Striker Block – Remove and Inspect					●					
Hammer – Disassemble and Inspect (Hammer Hours)						●				
Engine Valve Clearance – Adjust **(Yanmar Engines Only)**							●			
Air Cleaner Elements – Replace							●			
Hydraulic Fluid – Change							●			
Track Planetary Oil – Change							●			
Crankcase Breather Element – Replace								●		
Fuel Injectors – Clean and Test **(Yanmar Engines Only)**								●		
Crankcase Breather System – Inspect **(Yanmar Engines Only)**								●		
Fuel and Engine Coolant Hoses – Check/Replace **(Yanmar Engines Only)**									●	
Intake and Exhaust Valves – Lap **(Yanmar Engines Only)**									●	

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Service	Maintenance Interval – Service Hours									
	10 or Daily	50 or Weekly	125	250	500	750	1000	1500	2000	As Required
SCR Feed Pump Filter Cartridge – Replace									●	
Cooling System – Drain and Clean									●	
Battery – Replace										●
Air Cleaner Element(s) – Replace										●
Wear Pads – Adjust										●
Rollover Protection Structure (ROPS) – Check										●
Track Tension – Adjust										●
Hammer – Service										●
Fuses and Relays – Replace										●
Mast Removal/Assembly										●
Storage Procedure										●
Cleaning the Machine										●

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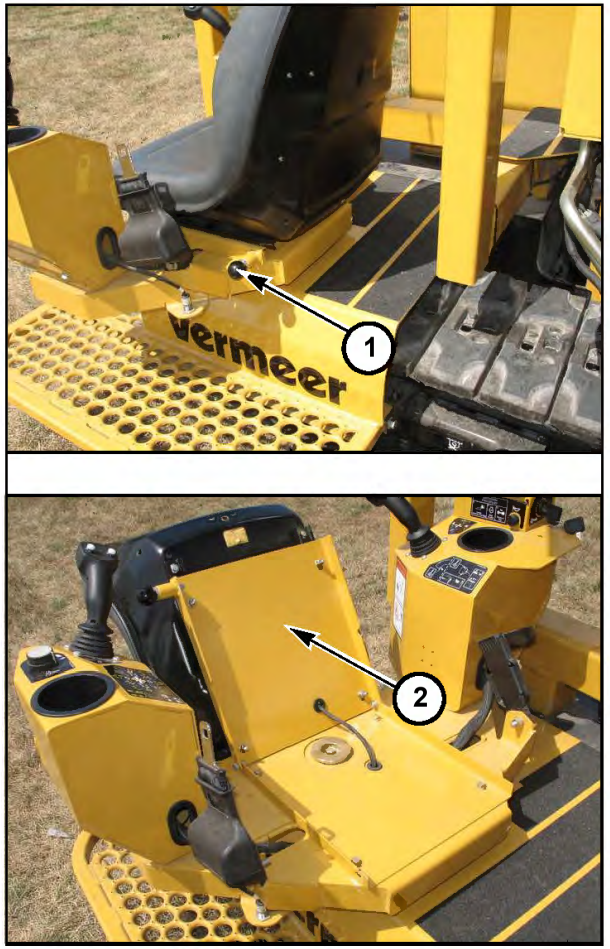
Access to Walkway

Step 1: Rotate seat to transport position.

Step 2: Slide seat fully back toward machine.

Step 3: Pull seat tip lever **(1)** out.

Step 4: Tip seat forward **(2)** to provide access to walkway.



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Every 10 Hours or Daily

Engine – Check

Refer to the Engine Operation Manual supplied with machine for complete information.

Check for:

- Oil leaks
- Fuel leaks
- Coolant leaks
- Damaged or missing parts
- Loose, missing, or damaged fasteners

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Hammer Point – Grease

In harsh environments, grease hourly.

Step 1: Support hammer in one of two ways:

- Lower hammer onto a post that has been driven in to a height that allows access to grease point.
- Lower hammer onto similar device that adequately supports hammer.

Step 2: Place hammer in float.

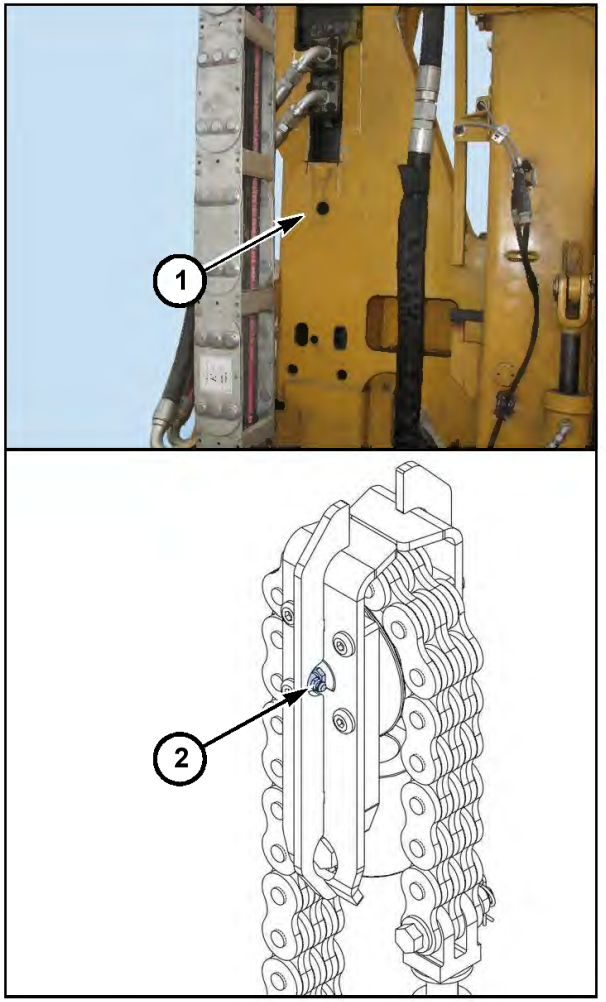
NOTICE: Before and during greasing, fully compress strike plate. Lower seals will be damaged if hammer is greased without full compression of striker plate.

Step 3: Purge fitting **(1)** with chisel paste hammer grease. Refer to “Lubricants,” *page 70-1.*

Step 4: 10-ft and 15-ft Mast: Raise hammer slightly and tilt mast down to access hammer lift roller fitting (2) for two shots of grease.

20-ft Mast: Lower hammer, slide mast out, and tilt mast toward machine to access hammer lift roller fitting **(2)** for two shots of grease.

Refer to “Lubricants,” *page 70-1.*



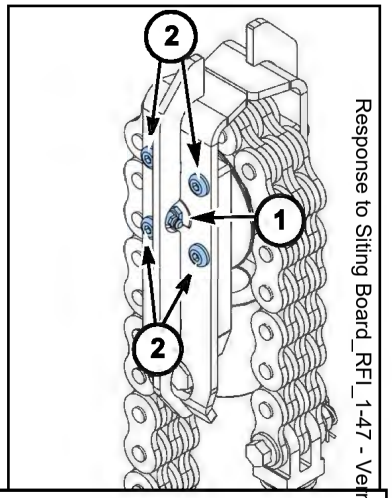
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Hammer Lift Roller – Grease

Step 1: Lower hammer onto support bar or other suitable support.

Step 2: Grease chain roller **(1)**.

Two shots. . . . . two fittings (one fitting on each side).



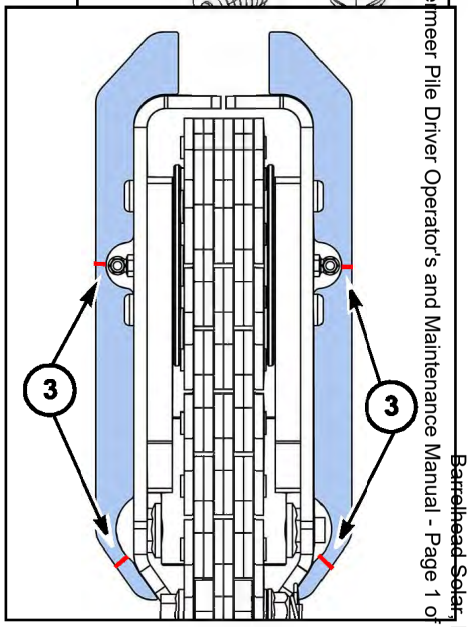
Hammer Lift Roller Nuts and Bolts – Check/Tighten

Tighten eight bolts **(2)**. Four bolts on each side.

Hammer Lift Roller - Wear and Tear

Ensure there are no areas less than 0.15 in (3.8 mm) in width. If material is too thin, replace with new guard. Two marked areas **(3)** are the concern (is a wear item and needs inspected to know if it needs replaced).

NOTE: If there is more than 0.25 in (6.3 mm) of wear on the hammer carriage side, replace carriage.



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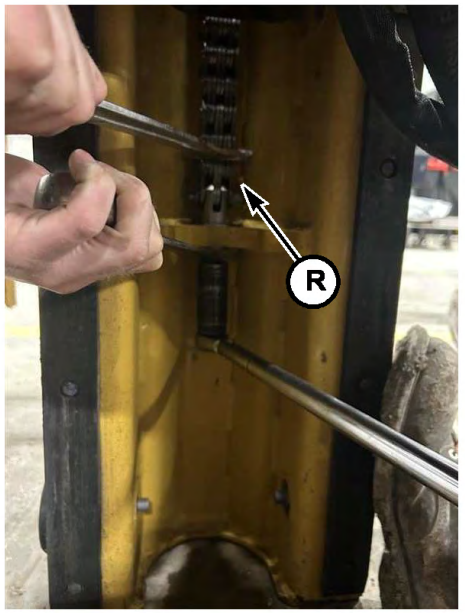
Hammer Chain Nut

If hardware comes loose or needs to be reinstalled, add the red threadlocker.

Torque first nut to 50 ft-lb (67.8 Nm) while using a backup wrench to prevent chain anchor from rotating.

While holding chain anchor **(R)** straight, place a wrench on the first nut to prevent it from turning while torquing the second nut to 238 ft-lb (322 Nm).

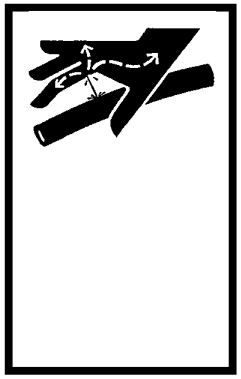
NOTICE: Placing a wrench on the first nut and preventing it from turning while torquing the second nut is very important when using the double nut method mentioned above.



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Machine – Check



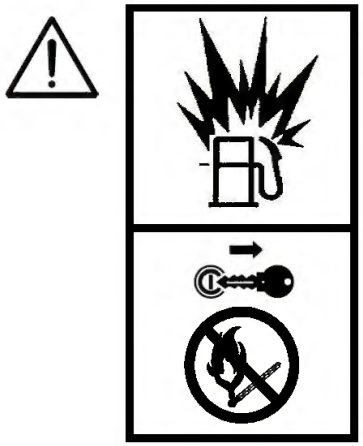
WARNING: Pressurized fluid can penetrate body tissue and result in death or serious injury. Leaks can be invisible. Keep away from a suspected leak. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

Check for:

- Cracks or abrasions in electrical harnesses
- Damage or corrosion on electrical connectors
- Hydraulic hoses for cracks or abrasions
- Loose or corroded hydraulic clamps

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Fuel Tank – Fill



WARNING: Fuel and fumes can explode and burn.

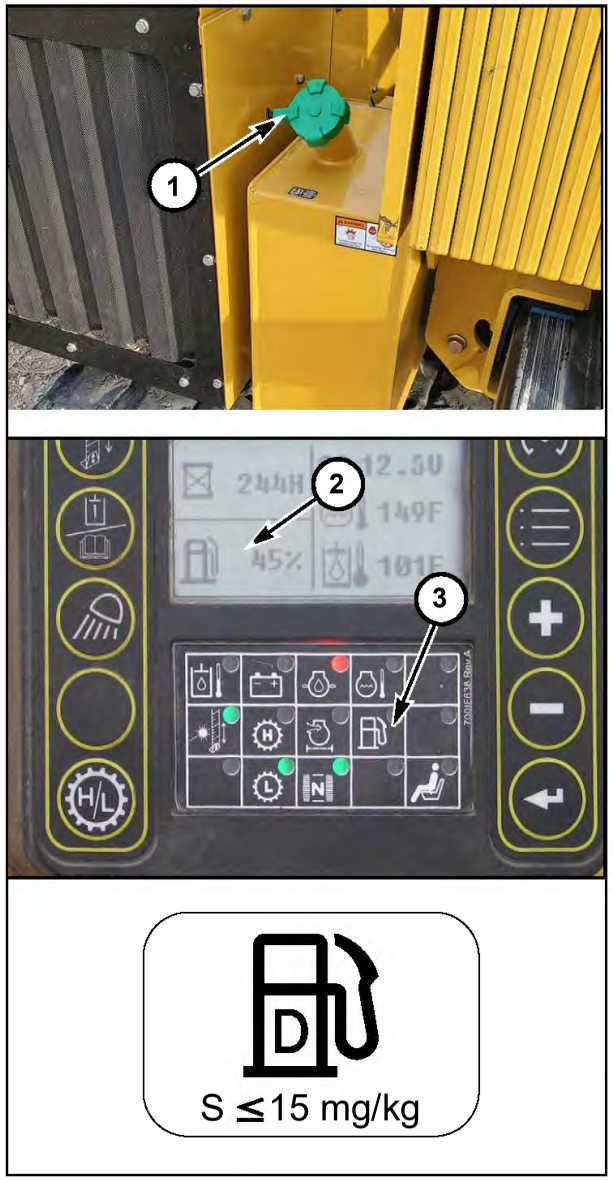
Shut off engine before refueling. No flame. No smoking.

Fill fuel tank at the end of each day to reduce condensation. Do not fill to the top; leave room for expansion.

(1) Fill cap

(2) Fuel gauge (on display)

(3) Fuel low indicator light

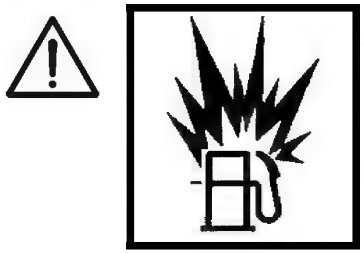


Diesel Fuel – Sulfur Content

Tier 4 engines require Ultra Low Sulfur Diesel (ULSD) fuel, with sulfur content less than 15 ppm (15 mg/kg). Use of fuels other than what is specified in the engine manual will impact engine performance, damage engine emissions systems, and may result in engine and exhaust system warranty being voided.

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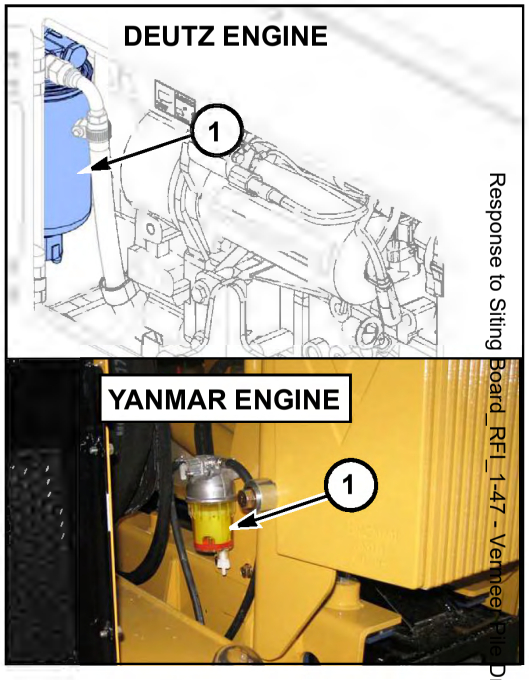
Fuel/Water Separator – Check/Drain



WARNING: Fuel and fumes can explode and burn.

Keep heat, flames, and sparks away from fuel. Always clean up spilled fuel. Do not smoke.

Check fuel/water separator for water or debris. Drain water from bottom as needed.

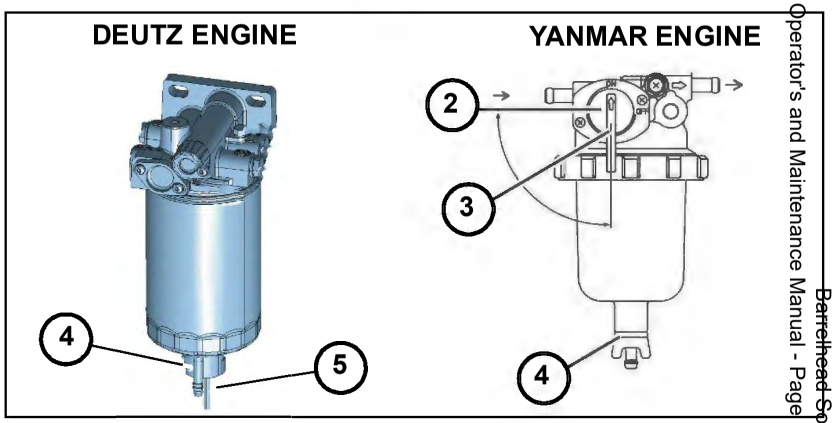


Deutz Engine

Step 1: Place suitable container(s) under separator **(1)**.
Step 2: Disconnect electrical cable **(5)**.
Step 3: Loosen drain plug **(4)**. Drain fluid until pure diesel fuel runs out.
Step 4: Tighten drain plug to 1.2 ft-lb (1.6 Nm)
Step 5: Connect electrical cable.
Step 6: Check for fuel leaks.

Yanmar Engine

Step 1: Place suitable container(s) under separator **(1)**.
Step 2: Close fuel cock **(2)**.
Step 3: Open drain cock **(4)**. Drain water.
Step 4: Close drain cock.
Step 5: Open fuel cock **(3)**.
Step 6: Turn *keyswitch* to on for 10 – 15 seconds to prime the fuel system.
Step 7: Check for fuel leaks.



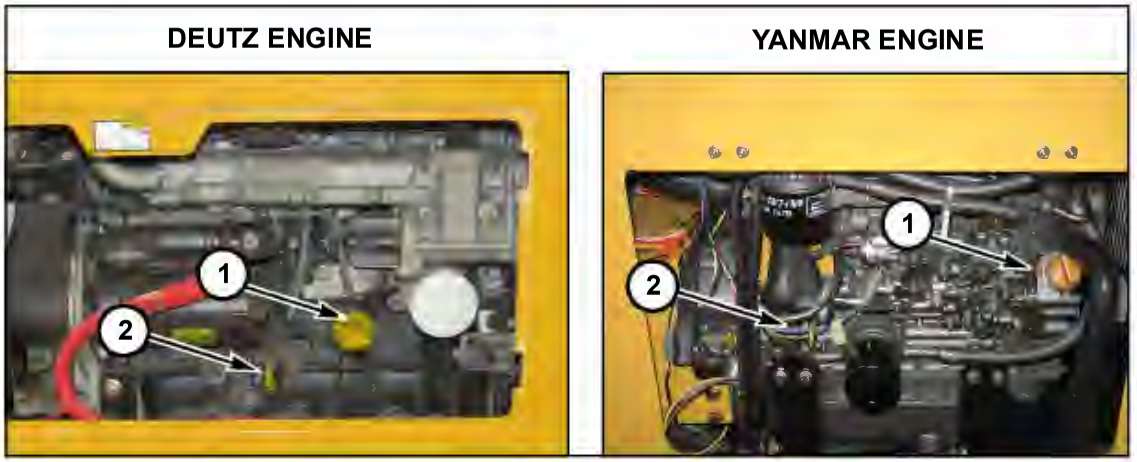
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Engine Oil Level – Check

With engine level, fill to full mark on dipstick. Do not overfill. Refer to “Lubricants,” *page 70-1.*

(1) Engine oil fill cap

(2) Dipstick



Hydraulic Oil Level – Check

NOTICE: Clean hydraulic fluid is important. Do not spill dirt or other contaminants into the tank. Filter all hydraulic fluid through a 5-micron filter before adding it to the tank. Check hydraulic fluid level. Refer to “Lubricants,” *page 70-1.*

Machine must be level and in transport position.

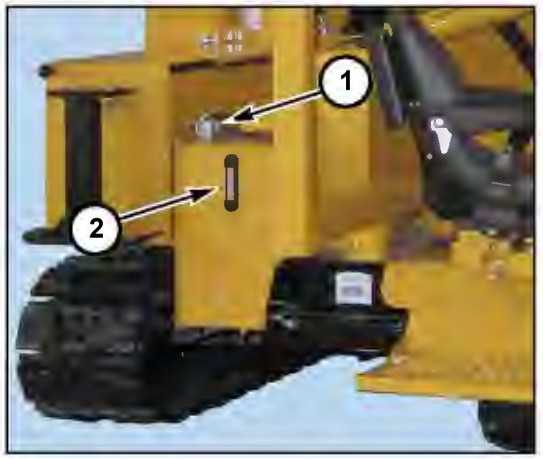
Step 1: Retract all cylinders.

Step 2: Check fluid level.

Step 3: If fluid is required, remove fill cap **(1)**.

Step 4: Fill to within the upper half of the sight gauge **(2)**.

Step 5: Install fill cap.

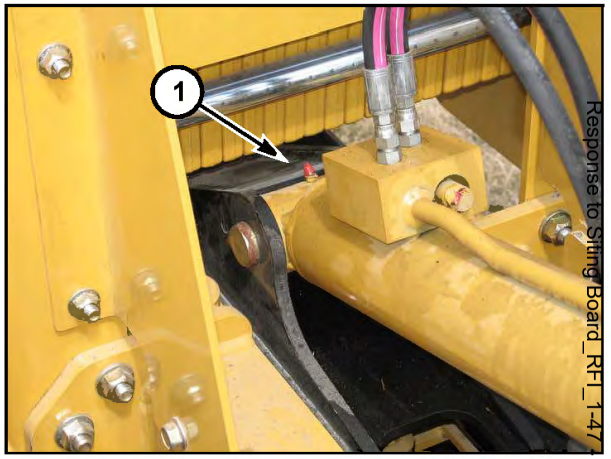


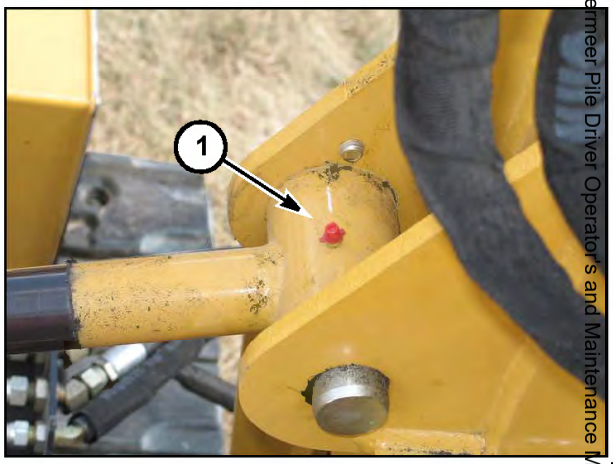
NOTICE: If fluid smells burned, contains air bubbles, or appears contaminated, contact Vermeer dealer immediately.

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Mast Tilt Cylinder – Grease

Three shots . . . . . one fitting each end





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Coolant Level - Check



WARNING: Hot fluid under pressure can erupt and scald if opened.

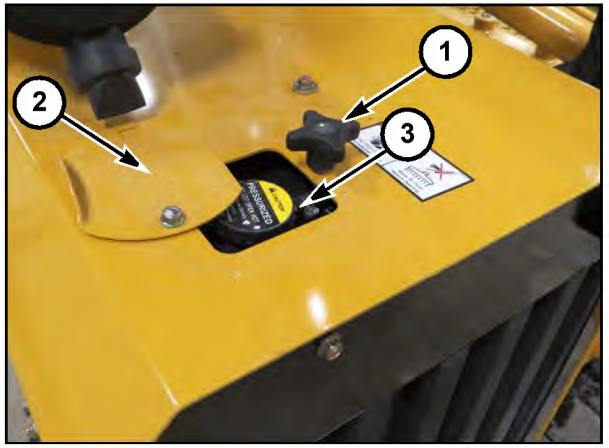
Allow to cool before opening radiator cap.

Unscrew knob **(1)** to slide plate **(2)** to the side.

Do not remove radiator cap from a hot engine. Wait until the temperature has decreased before removing the cap. Failure to do so can result in personal injury from heated coolant spray, or steam. Remove radiator cap slowly to relieve coolant system pressure.

Make a 50/50 mixture of coolant and distilled or deionized water. Lift hood and fill radiator to within 0.5 in (13 mm) of the bottom of fill pipe **(3)**.

NOTICE: This machine was factory-filled with a 50/50 mixture of Shell Rotella ELC NF (Extended Life Nitrite Free) coolant. Compatible coolants include Chevron Delo ELC NF and Exxon Mobil Delvac ELC NF. Never add pure antifreeze to the system; always dilute to a 50/50 mixture.



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Air Cleaner Restriction Indicator – Check

Check the air cleaner restriction indicator daily. Replace the primary filter element if the yellow indicator **(1)** reaches the red line **(2)** or if alert light **(3)** comes on. Push button **(4)** to reset the indicator.

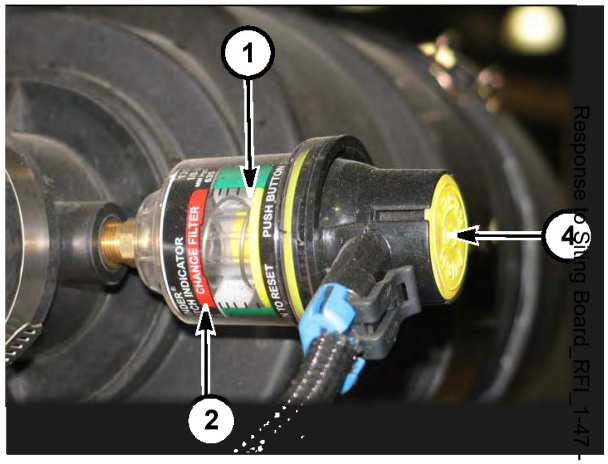
NOTICE: Do not remove air filter element(s) until the restriction indicator or the alert light shows replacement is needed, or if it is time for scheduled maintenance. The service interval for the primary element is every 500 hours and every 1,000 hours for the secondary element

NOTICE: Do not wash or blow out air cleaner elements. Elements must be replaced.

- Refer to “Primary Air Cleaner Element – Replace,” *page 60-42.*
- Refer to “Air Cleaner Elements – Replace,” *page 60-51.*

The air restriction indicator will not function correctly if:

- The air filter elements are damaged or not installed correctly.
- The air cleaner housing is damaged.
- The air duct between the air cleaner and the engine is damaged or clamps are loose.
- The air duct between the air cleaner and the air restriction indicator is damaged or pinched.





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Every 50 Hours or Weekly

Refer to the Engine Operation Manual supplied with machine for complete information.

- Check/Clean radiator fins.
- Perform initial check/adjustment of cooling fan V-belt tension after the first 50 hours, and every 250 hours thereafter.
- Check battery.

Wear Pads – Check

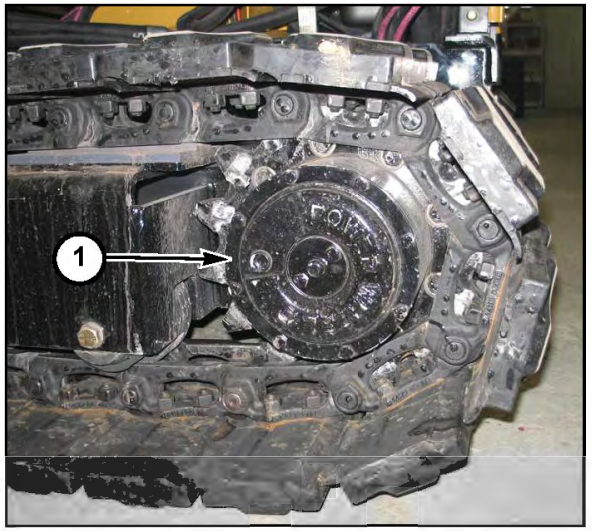
Refer to “Wear Pads – Adjust,” *page 60-61.*

Track Planetary Gearbox Oil Level – Check

Check oil level with plug at 3:00 or 9:00 position. Fill to check plug level.

(1) Fill/Check/Drain plug

Refer to “Lubricants,” *page 70-1.*



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Every 125 Hours

Safety Signs Maintenance

Safety signs located on your machine contain important and useful information that help you operate your equipment safely. Refer to the parts manual for locations.

To assure that all safety signs remain in place and in good condition:

- Keep safety signs clean. Use soap and water – not mineral spirits, abrasive cleaners, or other similar cleaners that will damage the sign.
- Replace damaged or missing safety signs. When attaching safety signs, the temperature of the mounting surface must be at least 40°F (5°C). The mounting surface must be clean and dry.
- When replacing a machine component with a safety sign attached, replace the safety sign also.

Replacement safety signs can be purchased from your Vermeer equipment dealer.

Backup Alarm - Check

The backup alarm must operate correctly to alert workers in the area when the machine is moving in reverse.

Check that the backup alarm sounds when:

- The operator is seated.
- The operator’s station is in transport mode.
- The machine is propelled in reverse.

The backup alarm does not sound when using the remote control.

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Overall Machine – Check

Shields and guards – Check that all shields and guards are installed and are fastened securely to machine. Replace and repair shields or guards that are damaged or have missing parts.

Hardware – Check machine for loose, worn, or missing parts and hardware. Tighten loose parts and replace worn or missing parts. Refer to the parts manual for replacement parts.

Frame – Check machine frame and contact Vermeer dealer immediately if you notice bending or cracking.

ROPS – Check ROPS and contact dealer immediately if you notice any bends, cracks, breaks, or signs of flexing.

Operator's platform – The operator's platform acts as a barrier to help keep the operator away from the tracks. If platform is damaged, repair or replace.

Fire prevention – Keep engine compartment, battery, hydraulic lines, fuel tank, and operator's station clean of accumulated trash, grease, and debris.

Slip resistant material – Check for worn or missing slip-resistant strips. Replace at once if damaged. Refer to the parts manual for replacement parts.

Electrical harness – Check that electrical harness and all wires are correctly supported and not rubbing on sharp corners. Support loose wires hanging under machine frame.

Horn – Press horn button to sound horn. Repair or replace if horn does not sound.

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Joysticks, Dial, Switches – Check

- Check joysticks, joystick switches/buttons, and dial for freedom of movement. Refer to *page 20-12.*
- Check that joysticks spring-return to neutral.
- Check dial for noticeable detent in center position. Refer to *page 20-17.*

Neutral Start Interlock – Check

Neutral start interlock system must operate correctly for safety.

Step 1: Clear area around machine.

Step 2: With engine off, move controls out of neutral.

Step 3: Follow *Starting Procedure,* page *22-1.* The functions that are out of neutral must not move until all of them are returned to neutral, and then back out of neutral.

Contact your Vermeer dealer function movement is detected before all controls are returned to neutral.

Indicator Lights – Check

Check indicator light operation. Turn *keyswitch* to on for bulb test. All indicator cluster lights should light for five seconds. If any bulbs do not light, contact your Vermeer dealer.

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Park Brake – Check

This procedure should be done while machine is in transport mode.

WARNING: Machine could move if park brakes are not functioning properly. Death or serious injury can result if a bystander is struck or run over. Clear area of all personnel before checking park brake holding capacity.

Step 1: Follow *Starting Procedure,* page *22-1.*

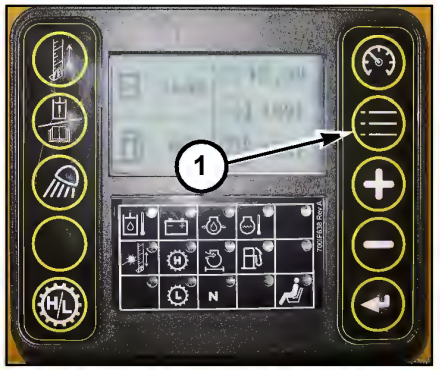
Step 2: Bring engine to 1,500 rpm.

Step 3: Press *menu key* **(1)** on display and select “CALIBRATION” from the menu list. Refer to *page 20-27.*

Step 4: Select “PARK BRAKE TEST” from calibration menu. Refer to *page 20-28.*

Step 5: Engage ground drive after selecting brake test. Machine should not move during test. Contact local Vermeer dealer if machine moves during test.

“DISENGAGE GROUND DRIVE THEN RETRY” will be shown on display if ground drive is active before selecting test.



Step 6: Return ground drive controls to neutral and press *menu key* **(1)** to exit test.

PARK BRAKE TEST	
ENGAGE GROUND DRIVE MACHINE SHOULD NOT MOVE PRESS MENU TO EXIT	DISENGAGE GROUND DRIVE THEN RETRY

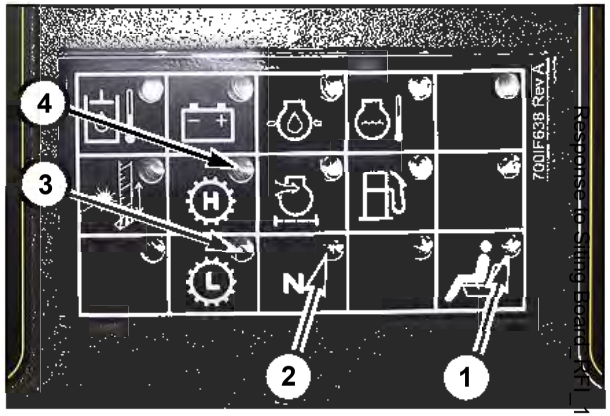
Operator Presence System – Check

The machine is equipped with an operator presence system. This system is intended for operator safety and must be maintained in good functional condition.

Follow *Starting Procedure,* page *22-1.* After starting the machine, check that operator presence system operates correctly.

- Operator presence indicator **(1)** must light whenever operator is in seat.
- Neutral indicator **(2)** must light when all controls are in neutral. If any control is not in neutral, the light goes off.
  - Machine must not move when ground drive is in neutral.
  - Hammer and mast must not move when controls are in neutral.

Contact Vermeer dealer if system does not work correctly.



Ground Drive Range Indicator Lights – Check

Check that green light **(3)** or **(4)** is on when the transmission is in low or high range, respectively.

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Operator's Station – Test

Before performing this test, clear area around machine.

Step 1: Sit in seat with operator's station in transport mode position. Operator's station controls for hammer, float, auto plumb, auto home, or auto target (if equipped) must not function.

Step 2: Sit in seat with station in work mode position. All controls should function.

Step 3: Rise out of seat. Operator presence indicator light will go out. No operator's station controls should function.



Transport Mode Position



Work Mode Position

Remote Control – Test

Before performing this test, clear area around machine.

Enable remote control. Refer to "Enable/Disable Remote Control," *page 21-6.* The beacon must turn on and horn must sound three times.

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Seat Belt Maintenance

Cleaning

Sponge webbing clean with mild soap and water. **Do not** use bleach, dye, or household detergents.

Maintenance

Seat belt webbing should not be allowed to run against sharp surfaces. Seat belts exposed to extreme conditions or climates must be inspected frequently and thoroughly. Seat belts that have been cut, frayed, malfunction in any way or were installed on a vehicle subsequently involved in an accident must be replaced. Always replace the entire seat belt system including belt, buckle, retractor, and mounting hardware.



WARNING: Failure to properly inspect and maintain the seat belt may result in death or serious injury. It is critical that any time a machine is involved in an accident, the entire seat belt system must be replaced. A seat belt should be considered to have a finite life and must be replaced as needed throughout the life of the machine. Seat belt must be inspected for needed maintenance every 100 hours or more often if exposed to severe environmental or vocational conditions.

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Inspection

Step 1: Check webbing. Pull the webbing out of the belt retractor and inspect the full length of the webbing for cuts, wear, fraying, dirt, and stiffness. If a belt shows cuts, fraying, extreme or unusual wear, the system should be replaced.

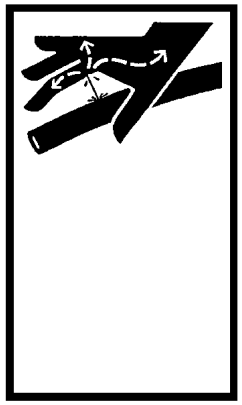
Step 2: Check buckle and latch for correct operation and to determine if latch plate is excessively worn, deformed, or if buckle is damaged or casing is broken.

Step 3: Check retractor web storage device operation by extending webbing to determine it locks properly and that it spools out and retracts webbing properly.

Step 4: Check web in areas exposed to ultraviolet rays from the sun or to extreme dust or dirt. If the original color of the web in these areas is extremely faded and/or the web is packed with dirt, the physical strength of this web may have deteriorated. If this condition exists, replace the system.

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Hydraulic System – Check



WARNING: Pressurized fluid can penetrate body tissue and result in death or serious injury. Leaks can be invisible. Keep away from a suspected leak. Relieve pressure in the hydraulic system before searching for leaks, disconnecting hoses, or performing other work on the system. If you must pressurize the system to find a suspected leak, use an object such as a piece of wood or cardboard rather than your hands. When loosening a fitting where some residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Fluid injected under the skin must be removed immediately by a surgeon familiar with this type of injury.

Hydraulic System Pressure – Relieve

Relieve all pressure in the hydraulic system before disconnecting hoses or performing other work on the system.

When loosening fittings in hoses where residual pressure may exist, slowly loosen the fitting until oil begins to leak. Wait for leaking to stop before disconnecting the fitting. Ensure all connections are tight and hoses are in good condition before applying pressure to the system.

Hydraulic Systems – Check

Check machine and all attachments. Refer to the parts manual for replacement parts.

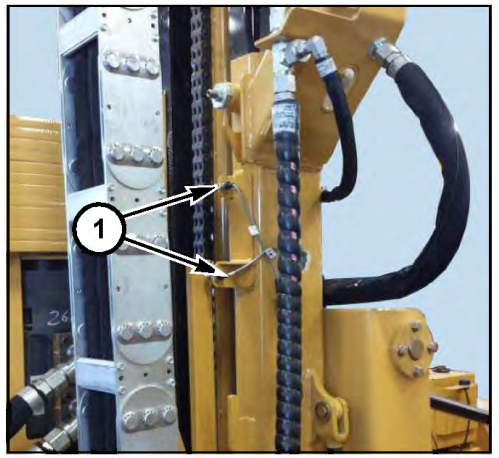
- Ensure all connections are tight and hoses are in good condition before applying hydraulic pressure to the system.
- Check for leaking hoses, kinked hoses, and for hoses that rub against each other, or other parts of the machine. Replace all deteriorated or damaged hoses. When a hose with a protective sleeve is replaced, always install a new protective sleeve over the new hose.
- Check hydraulic cylinders for leaks and damage. Repair or replace as required.

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Hammer Proximity Switches – Check

S/N 1001 – 2263

Warm hydraulic oil, then check proximity switches **(1)** for function.



With the hammer in the “sensing area” between two switches:

- Tilt mast to the rear of machine and check the gap.
- Tilt mast to the front and check gap.

Correct switch clearance is 0.25 – 0.5 in (6 – 13 mm) for the entire hammer position range.

Adjust hammer adjusters correctly before adjusting switch gap. Refer to *page 60-62.*

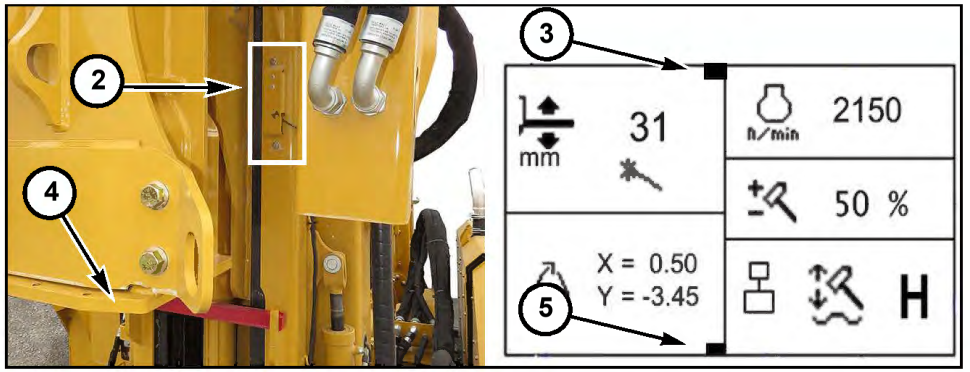
To adjust:

Loosen nuts on back sides of switches.

S/N 2264 –

While in the main screen, raise hammer. Hammer position indicator **(3)** must illuminate when bottom of hammer carriage **(4)** is above sensor **(2)**. Ensure position indicator illuminates on machine display and remote-control display.

While in the main screen, lower hammer. Hammer position indicator **(5)** must illuminate when bottom of hammer carriage **(4)** is below sensor **(2)**. Ensure position indicator illuminates on machine display and remote-control display.



If test fails, contact your Vermeer dealer.

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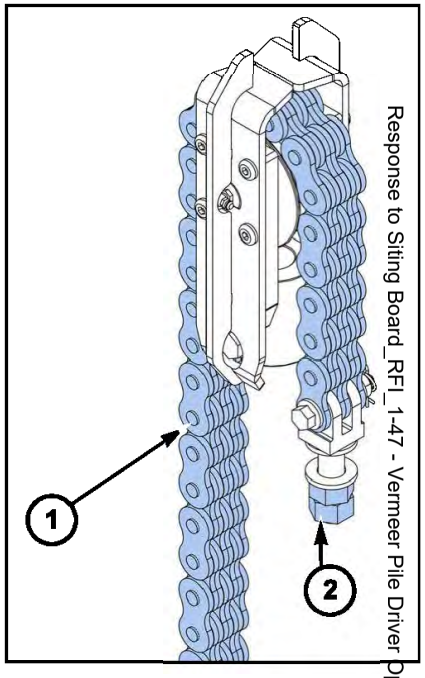
Percussion Hammer Lifting Chain, Anchor, and Pins – Check/Clean/Lubricate

Inspect lifting chain, anchor, and pins. Refer to “Chain – Inspect,” *page 60-47.*

Clean chain **(1)** with an appropriate cleaner like a paraffin-derived product.

Lubricate with dry spray lubricant.

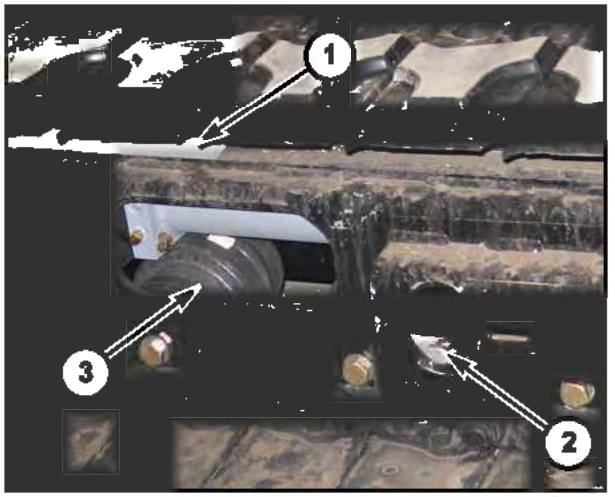
The nuts **(2)** holding the anchor bolt needs to be checked for tightness every 125 hours. Refer to “Hammer Chain Nut,” *page 60-14.*



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Ground Drive System – Inspect

Check condition of wear plates. Replace wear plates if missing or if thickness is less than 0.06 in (1.6 mm).



(1) Upper track wear plate
One per each track.

(2) Lower track wear plates
One per each track.

In extremely dusty conditions, check daily.

Replace wear plates before heads of mounting screws are damaged. Refer to the service manual for procedures.

(3) Lower track rollers
Seven on each side. Ensure all rollers roll when track weight is on them and machine is moving. Replace a roller if it does not turn.

Track Pads and Bolt Torque – Check

Check for loose or damaged track pads. Replace damaged pads. Tighten loose bolts.

Track Chain Tension – Check

Refer to “Track Tension – Adjust,” *page 60-63.*

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Every 250 Hours

Refer to the Engine Operation Manual supplied with machine for complete information.

- Check/Adjust cooling fan V-belt tension.
- Check/Adjust governor lever and engine speed control **(Yanmar engines only)**.

Engine Oil and Filter - Change

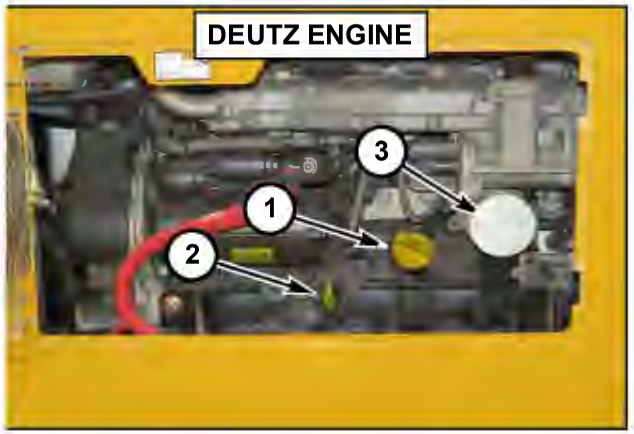
Replace engine oil and filter after the first 50 hours of operation, and every 250 hours thereafter. Refer to “Lubricants,” *page 70-1.*

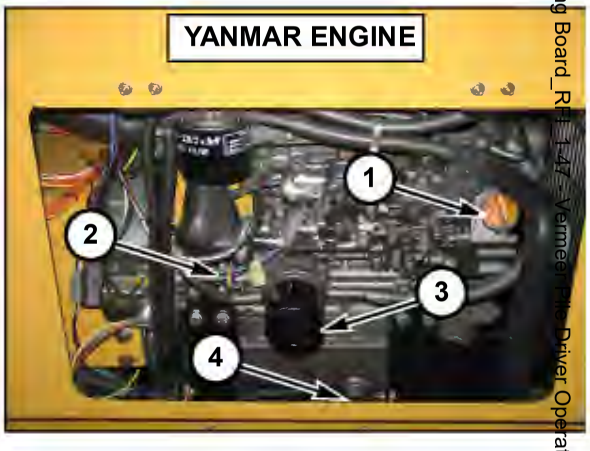
(1) Oil Fill

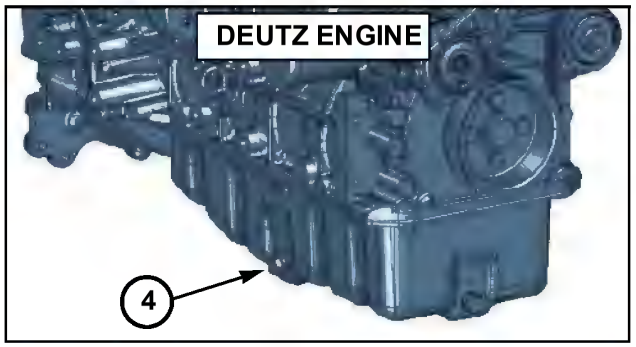
(2) Dipstick

(3) Oil Filter

(4) Drain Plug







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Change oil and replace filter while engine is still warm. Engine must be level.

Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Remove oil fill **(1)** cap.

Step 3: Remove drain plug **(4)** and drain oil into suitable container.

Step 4: Install drain plug.

Step 5: Remove oil filter **(3)** with oil filter wrench (counterclockwise). Clean gasket surface of filter head.

Step 6: Coat gasket of new filter with engine oil.

Step 7: Install new filter by hand (clockwise) until filter gasket contacts filter head surface.

Step 8: Tighten new filter an additional three quarters of a turn using filter wrench.

Step 9: Add new engine oil to engine. Refer to “Lubricants,” *page 70-1.*

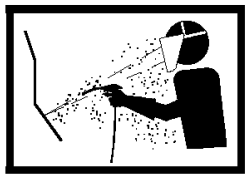
Step 10: Follow *Starting Procedure,* page *22-1.* Check for oil leaks.

Step 11: After engine is warm, shut it off. Follow *Shutdown Procedure,* page *23-1.*

Check engine oil level using dipstick **(2)**. Oil level must be between MIN and MAX marks on dipstick. Add oil as necessary.

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Radiator and Hydraulic Oil Cooler – Clean



WARNING: Eye injury possible. Wear a face shield when using compressed air to clean or dry solvent-coated parts.

Clean fins with water or compressed air. Partially blocked fins will increase hydraulic oil and engine operating temperature. Be careful not to damage cooler fins, which will decrease cooling performance.

NOTICE: Verify water nozzle is at least 12 in (30.5 cm) from the cooler and air nozzle is at least 8 in (20.3 cm) from the cooler. Direct the water or air straight through the cooler to avoid bending the cooler fins.

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Hydraulic Filters – Replace (Initial)

Capacities and specifications are listed in “Lubricants.” Refer to *page 70-1.*

Replace hydraulic fluid filter:

- After initial 250 service hours, then every 500 service hours
- Each time hydraulic fluid is changed

(1) Charge filter

(2) Return filter

Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Thoroughly clean area around filter to keep contaminants out of hydraulic system.

Step 3: Place a suitable container under machine to collect oil.

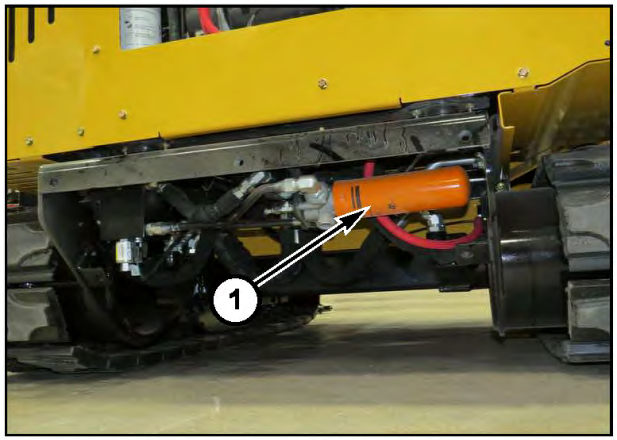
Step 4: Use a filter wrench to turn filter body counterclockwise to remove filter.

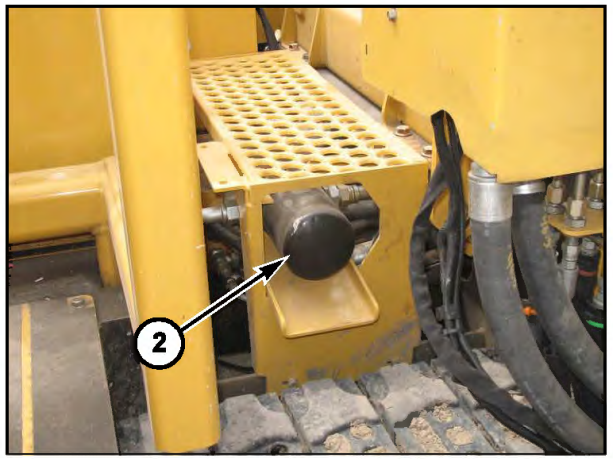
Step 5: Carefully clean mating surface of filter head with a lint-free cloth. Look for cracks or pitting in filter head. If needed, replace filter head.

Step 6: Apply a thin film of oil to gasket of new filter.

Step 7: Install filter onto filter head. Tighten clockwise by hand until filter gasket contacts filter head.

Step 8: Turn three quarters to one additional turn.





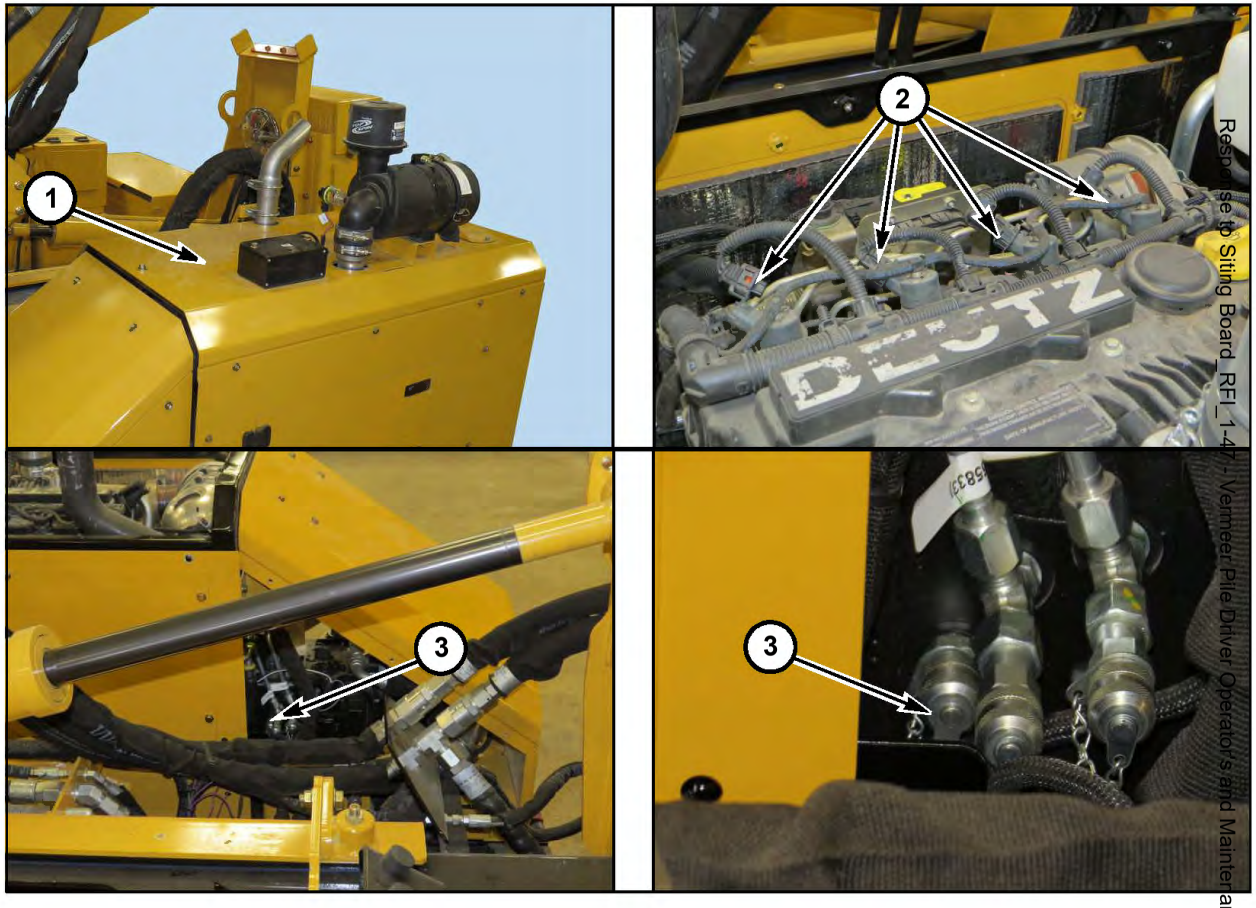
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Hydraulic System – Restore

Step 1: Remove top shield **(1)**. Disconnect four fuel injectors **(2)** to prevent engine from starting.

Step 2: Install a low-pressure gauge with a range of 0 – 600 psi (0 – 4.1 MPa) on port **(3)**. Crank engine until a minimum charge pressure of 200 psi (1.4 MPa) is reached.

NOTICE: Never operate starter motor for more than 15 seconds at a time. Cycle key off and on to reset. Allow starter motor to cool 30 seconds between attempts. Turn key to off position before restarting.



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Step 3: After charge pressure has been reached, connect fuel injectors.

Step 4: Follow *Starting Procedure,* page *22-1.* Operate engine at low idle for four minutes while checking for leaks.

NOTICE: Do not operate hammer, mast, or *ground drive controls*, or raise engine speed above low idle for at least four minutes.

Step 5: Follow *Shutdown Procedure,* page *23-1.*

Step 6: Check hydraulic fluid level. The fluid level must be within the upper half of the sight gauge with all cylinders retracted.

Step 7: Start engine.

Step 8: Cycle all hydraulic cylinders and hammer functions to fill all components.

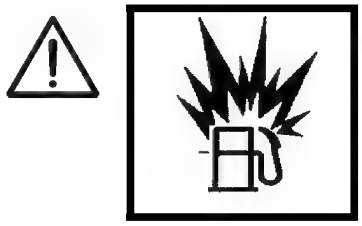
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Every 500 Hours

Hydraulic Filters – Replace

Refer to “Hydraulic Filters – Replace (Initial),” *page 60-38.*

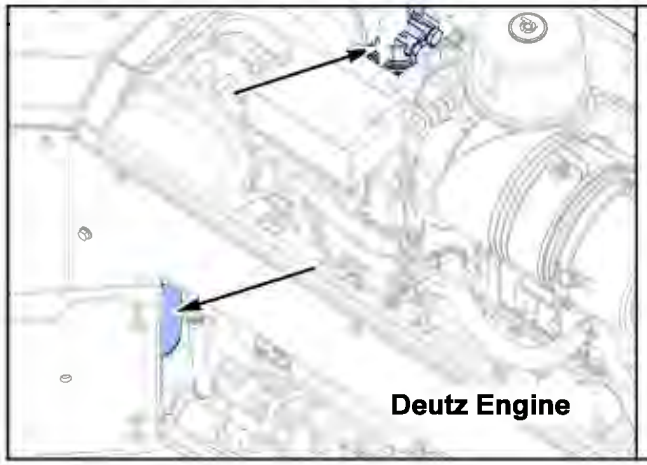
Fuel Filters – Replace



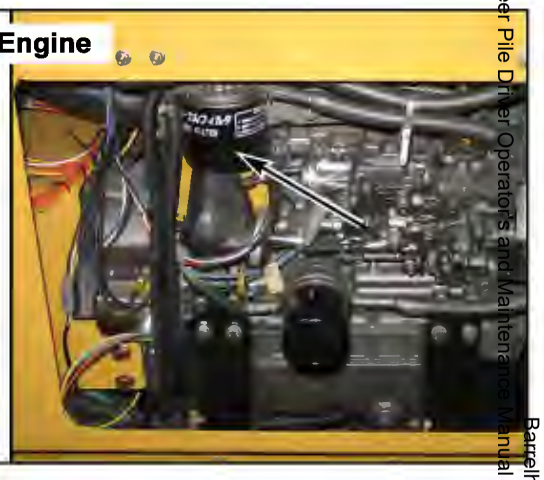
WARNING: Fuel and fumes can explode and burn.

Keep heat, flames, and sparks away from fuel. Always clean up spilled fuel. Do not smoke.

Refer to the Engine Operation Manual for procedures.







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Primary Air Cleaner Element – Replace

Replace the Primary element every 500 service hours and the secondary element every 1,000 service hours. Refer to *page 60-51.*

NOTICE: Harsh, dirty, or dusty environments may require more frequent changes. Refer to “Air Cleaner Restriction Indicator – Check,” *page 60-21.*

NOTICE: Do not clean and return a used element back into service. Air cleaner element must be replaced.

Step 1: Release latches **(1)** and remove cover **(2)**.

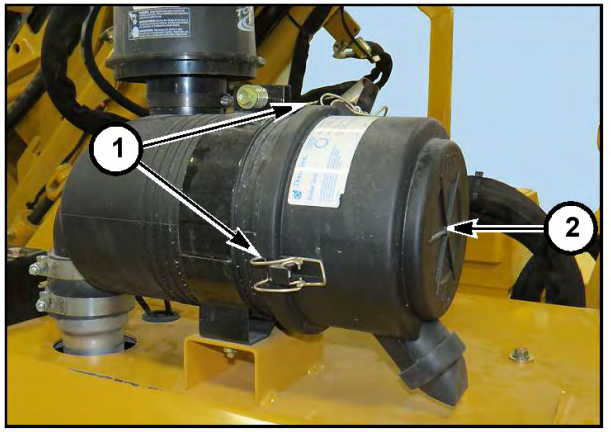
Step 2: Remove the primary filter element and discard.

Step 3: Wipe inside of housing with a clean cloth.

Step 4: Install new primary filter element.

Element must be properly installed and seated.

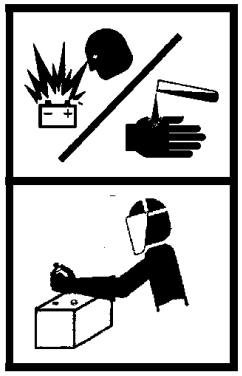
Step 5: Install cover and secure latches.



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Battery Maintenance



WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Battery explosion can blind. Acid can blind and burn. Tools and cable clamps can make sparks.

Do not smoke. Shield eyes and face. Read instructions.

- Use a flashlight to check electrolyte level, if equipped.
- Work in a well-ventilated area.
- Prevent breathing fumes from battery.
- Prevent contact with skin, eyes, or clothing.
- Keep flames and sparks away, and do not smoke.
- Keep out of reach of children.
- Do not short across battery terminals or allow tools to short from battery terminals to frame.
- Do not jump-start or charge a battery with frozen electrolyte.

In case of acid contact:

External: Flush with plenty of water. If eyes have been exposed, flush with water for 15 minutes and get prompt medical aid.

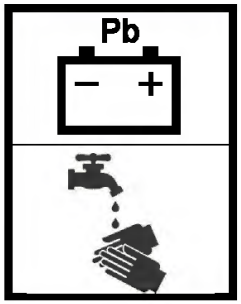
Internal: Drink large quantities of water or milk, then milk of magnesia, beaten egg, or vegetable oil. Call a physician immediately.

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Battery Cables and Connections – Check

Check battery cables for wear. Verify all battery connections are clean, tight, and corrosion-free.

Battery Terminals – Clean



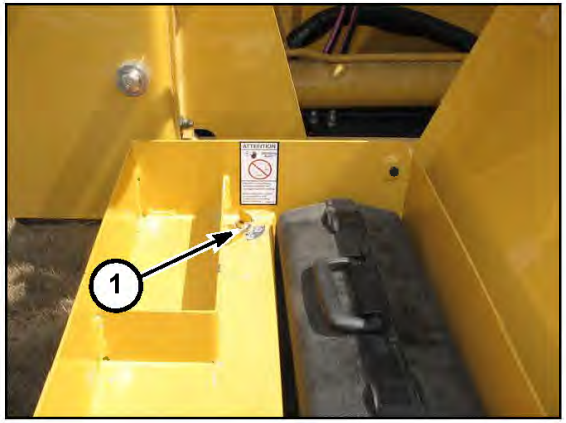
WARNING: Battery post, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.

Wash hands after handling.

Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Disconnect battery ground with the *battery disconnect switch* **(1)**.

Step 3: Open battery compartment.



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Step 4: Remove negative (-) cable **(2)**, then positive (+) cable **(3)**.

Step 5: Clean terminals and clamps with a stiff wire brush.

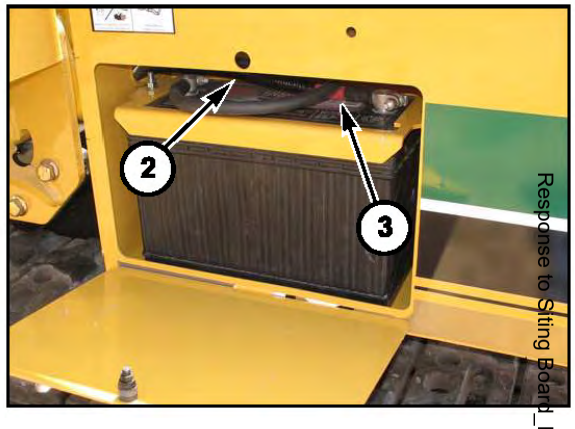
Step 6: Apply a light coating of petroleum jelly around base of each terminal.

NOTICE: Keep top of battery clean. If necessary, wash it with a baking soda solution, then rinse with clean water. Do not let baking soda solution enter battery.

Step 7: Install positive cable, then negative cable. Install plastic cap over positive cable clamp.

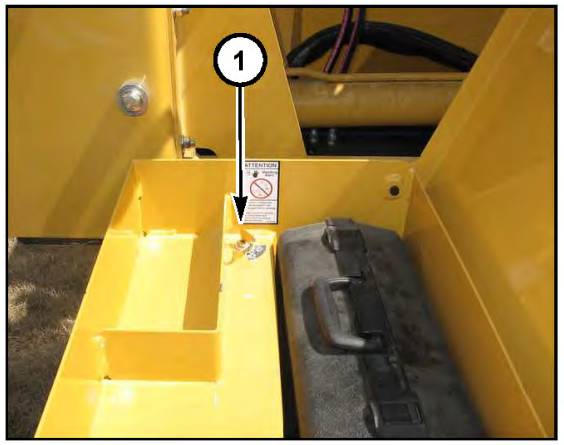
Step 8: Close battery compartment.

Step 9: Reconnect battery ground with *battery disconnect switch*.



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Battery Electrolyte Levels – Check (If Equipped)



Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Disconnect battery ground using battery disconnect switch **(1)**.

Step 3: Open battery compartment.

Step 4: Remove battery.

Step 5: Remove cell caps.

Step 6: Fill each cell with distilled water fluid level is low.

NOTICE: If battery is underfilled, the electrolyte will be too concentrated, causing plates to deteriorate more rapidly and plate tops to harden and become chemically inactive. Add distilled water, but do not overfill. In freezing weather, run engine for a few minutes immediately after filling battery to allow proper mixing of water and electrolyte. If battery uses too much water, check alternator voltage regulator for overcharging.

Step 7: Install cell caps.

Step 8: Install battery. Refer to “Battery – Replace,” *page 60-58.*

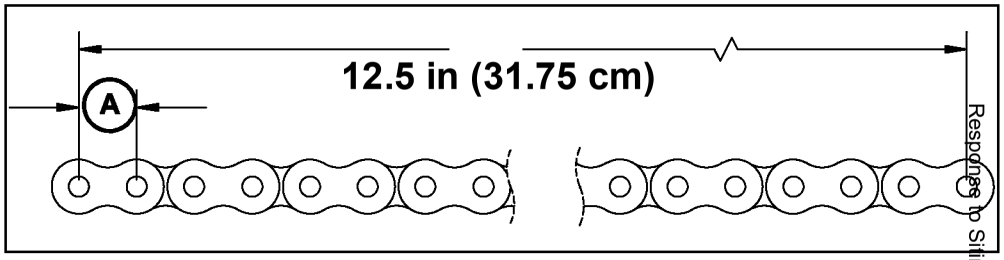
Step 9: Close battery compartment.

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Chain – Inspect

Check chain assemblies for split leaves, loose pins, excessive wear, or elongation.



To measure chain wear:

Step 1: Fully lower hammer, then raise enough to put full weight of hammer onto chain.

Step 2: Measure 11 pins of chain center to center **(A)**.
The correct measurement for 11 pins of new chain is 12.5 in (31.75 cm).

Replace chain if 11 pins measure more than 12.75 in (32.4 cm).

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Blunt Tool/Strike Block – Remove and Inspect

Blunt Tool/Strike Block – Remove

Step 1: Remove four bolts and nuts to remove cover plate **(1)** from hammer housing **(2)**.

Step 2: Rotate extractor plate **(3)** and secure with pin.

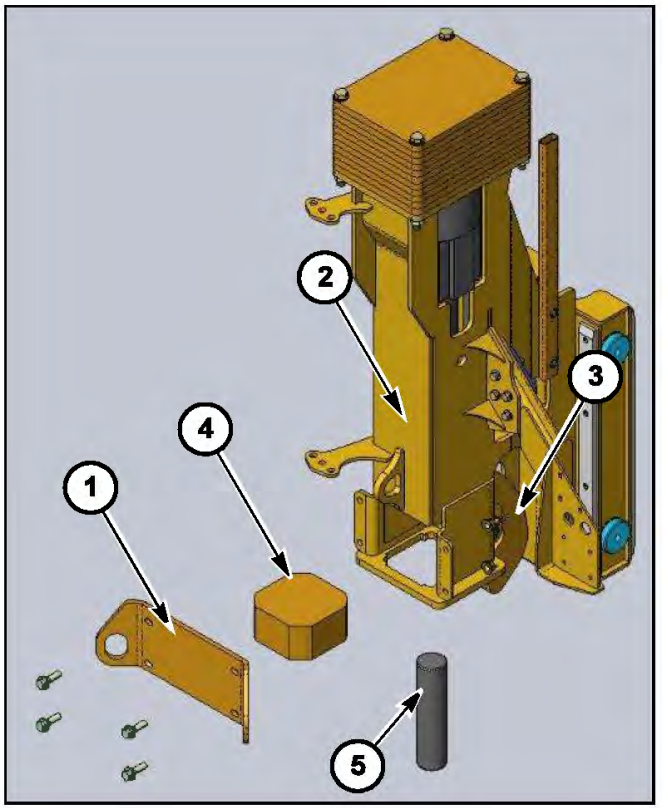
WARNING: In Step 3, when sliding striker block **(4)** out of opening in hammer housing, maintain a firm grip on block as it weighs in excess of 50 lb (23 kg). Also, slide block out very slowly and keep one hand on it. At the same time, reach inside from below with other hand to grasp end of blunt tool **(5)**. This prevents the tool, which weighs in excess of 20 lb (9 kg), from falling freely out of hammer assembly, potentially causing injury. Get an assistant to help.

Step 3: Slowly slide striker block **(4)** out from hammer housing just enough to allow blunt tool **(5)** to come out of bushing. Be prepared to prevent blunt tool from falling out of hammer once striker blocker has cleared end of tool.

Step 4: Remove blunt tool.

Step 5: Inspect blunt tool for burrs and excessive wear.

- Carefully grind off burrs.
- Replace tool if excessively worn. Contact your Vermeer dealer.



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Bushing – Inspect

If bushing ID is the same as retainer ring ID, bushing must be replaced.

Bushing – Remove

Remove retainer ring. Bushing may drop out.

If bushing does not slide out easily, contact your Vermeer dealer.

Blunt Tool/Striker Block – Install

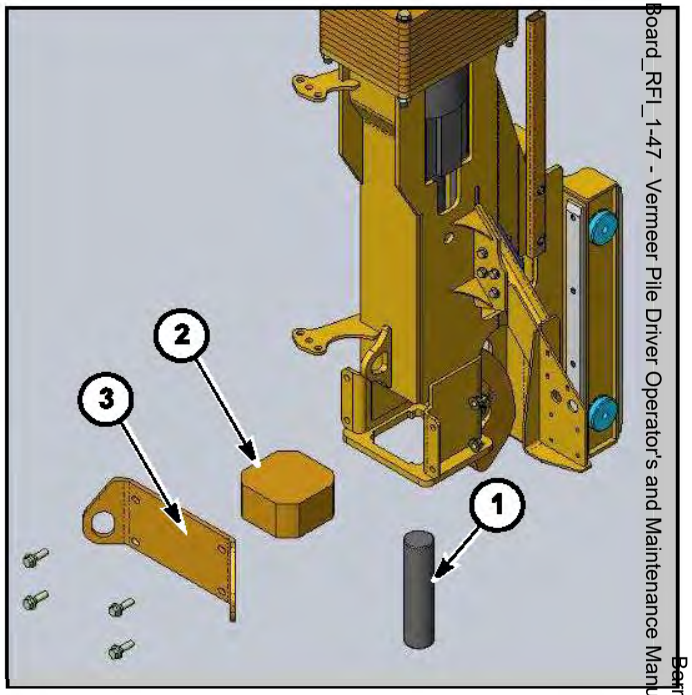
Step 1: Install bushing.

Step 2: Install retainer ring.

Step 3: Install blunt tool **(1)** into bushing.

Step 4: Install striker block **(2)**.

Step 5: Install cover plate **(3)** and secure with four bolts and nuts.



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Every 750 Hours

Hammer Disassemble/Inspect

Hammer assembly should be removed and disassembled for inspection every 750 hammer hours.

Contact your Vermeer dealer for assistance.

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Every 1000 Hours

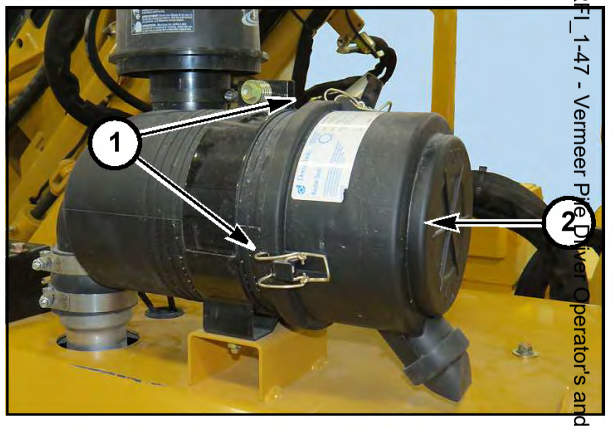
Refer to the Engine Operation Manual supplied with machine for complete information.

- Engine valve clearance – adjust (Yanmar engines only).

Air Cleaner Elements – Replace

NOTICE: Harsh, dirty, or dusty environments may require more frequent changes. Refer to “Air Cleaner Restriction Indicator – Check,” *page 60-21.*

NOTICE: Do not clean and return a used element back into service. Air cleaner elements must be replaced.



Step 1: Release latches **(1)** and remove cover **(2)**.

Step 2: Remove the primary filter element and discard.

Step 3: Wipe inside of housing with a clean cloth.

Step 4: Remove the secondary filter element and discard.

NOTICE: Do not allow any debris to enter the intake port.

Step 5: Install new secondary element.

Element must be properly installed and seated.

Step 6: Install new primary element.

Element must be properly installed and seated.

Step 7: Install cover and secure latches.

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Hydraulic Fluid – Change

Capacities and specifications are listed in “Lubricants.” Refer to *page 70-1.*

NOTICE: If fluid smells burnt, contains air bubbles, or appears contaminated, consult your Vermeer dealer immediately.

Step 1: Operate engine until hydraulic fluid is warm.

Step 2: Follow *Shutdown Procedure,* page *23-1.*

Step 3: Remove fill cap **(1)** and O-ring and strainer under cap.

Step 4: Remove two drain plugs from bottom of hydraulic tank and drain fluid into a suitable container, 36-gal (140-L) capacity minimum.

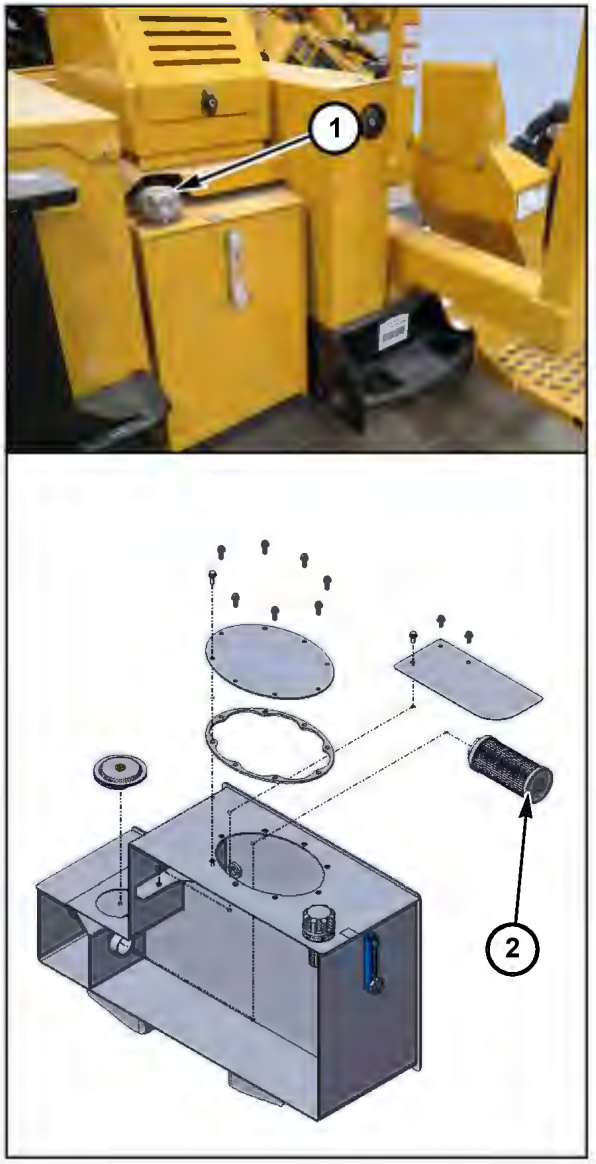
Step 5: Remove strainer **(2)** from inside of tank.

Step 6: Clean and inspect drain plugs.

NOTICE: Contact your Vermeer dealer if excessive metal particles are found on the magnetic drain plugs.

Step 7: Install drain plugs.

Step 8: Replace hydraulic filters. Refer to “Hydraulic Filters – Replace (Initial),” *page 60-38.*



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Strainer – Clean and Inspect

Clean strainer with a petroleum-based paint thinner or other good cleaning solvent. Scrub strainer with a soft-bristled brush.

Inspect strainer. Consult a Vermeer dealer if you find:

- Lacquers that may have formed as a result of hot spots in the hydraulic system
- An extremely dirty strainer that will not come clean
- Metallic particles on the screen mesh
- Evidence of a hydraulic system failure
- Evidence of holes or other damage that would allow unfiltered fluid to circulate in the hydraulic system

Strainer – Install

Install strainer and fill cap.

Tank – Fill

NOTICE: Clean hydraulic fluid is very important for longer life and good operation of hydraulic components. Take care not to spill dirt or other contaminants into the tank when checking or adding hydraulic fluid. Filter all hydraulic fluid through a 5-micron filter before adding it to the tank.

Step 1: Fill hydraulic fluid tank. Refer to “Lubricants,” *page 70-1.*

Step 2: Install and tighten fill cap.

Hydraulic System – Restore

Refer to “Hydraulic System – Restore,” *page 60-39.*

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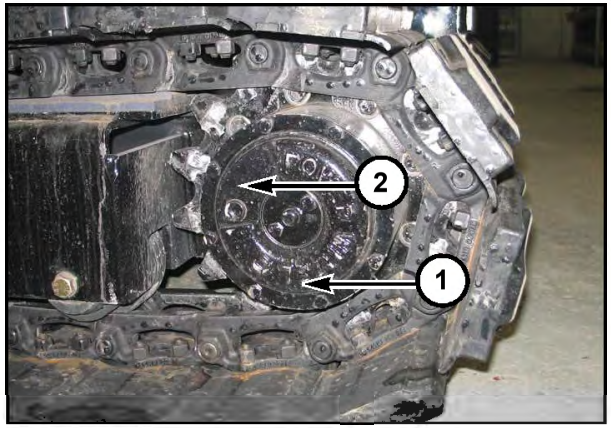
Track Planetary Oil – Change

Fill/Check/Drain plug

(1) Drain position: Rotate plug to bottom to drain.

(2) Fill/Check at 3:00 or 9:00 position: Fill to check plug level.

Refer to “Lubricants,” *page 70-1.*



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Every 1500 Hours

Refer to the Engine Operation Manual supplied with machine for complete information.

- Crankcase breather element - replace

Yanmar Engines Only:

- Inspect crankcase breather system.
- Inspect, clean, and test fuel injectors. Contact your Vermeer dealer for assistance.

Every 2000 Hours

Refer to the Engine Operation Manual supplied with machine for complete information.

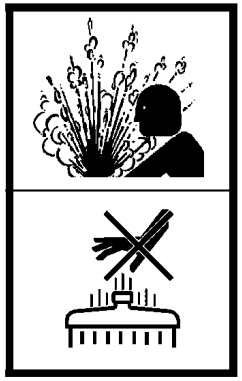
- SCR feed pump filter cartridge – replace
- Cooling system – drain and clean. Refer to *page 60-56.*

Yanmar Engines Only:

- Check and replace fuel hoses and engine coolant hoses.
- Lap the intake and exhaust valves. Contact your Vermeer dealer for assistance.

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Cooling System – Drain and Clean



WARNING: Hot fluid under pressure can scald.

Allow engine to cool before opening radiator cap.

Capacities and specifications are listed in “Lubricants.” Refer to *page 70-1.*

Drain, flush, and refill cooling system with new coolant every 2000 hours or every year. Refer to the Engine Operation Manual for complete procedure.

Use a 50/50 mixture of Extended Life (ELC) Nitrite-Free (NF) coolant and distilled or deionized water. Never add pure antifreeze to the system; always dilute to a 50/50 mixture. Never use Supplemental Cooling Additives (SCAs) with ELC coolant. Refer to the Engine Operation Manual for more information.

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Maintenance as Required

Engine Maintenance

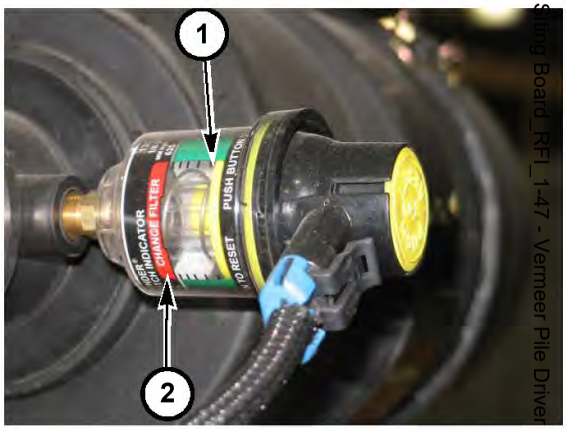
Refer to the Engine Operation Manual supplied with machine for complete information.

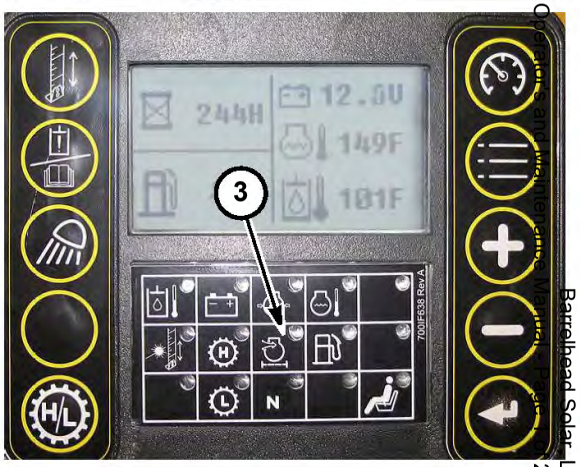
Air Cleaner – Replace Element(s) as Needed

Replace the primary filter element when yellow indicator **(1)** reaches the red band **(2)** or when alert light **(3)** comes on.

For additional information:

- Refer to “Air Cleaner Restriction Indicator – Check,” *page 60-21.*
- Refer to “Primary Air Cleaner Element – Replace,” *page 60-42.*
- Refer to “Air Cleaner Elements – Replace,” *page 60-51.*





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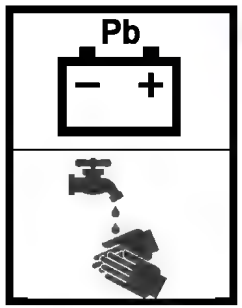
Battery – Replace

Replacement batteries must meet standard battery specifications provided in “Machine Specifications.” Refer to *page 70-2.*



WARNING: Battery fumes are flammable and can explode. Keep all burning materials away from battery. Battery explosion can blind. Acid can blind and burn. Tools and cable clamps can make sparks.

Do not smoke. Shield eyes and face. Read instructions.



WARNING: Battery post, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.

Wash hands after handling.

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Step 1: Follow *Shutdown Procedure,* page *23-1.*

Step 2: Turn *battery disconnect switch* **(1)** to disconnect.

Step 3: Open battery compartment **(2)**.

Step 4: Remove battery hold-down bracket **(3)**.

Step 5: Remove negative (-) cable **(4)** first. Then remove positive (+) cable **(5)**.

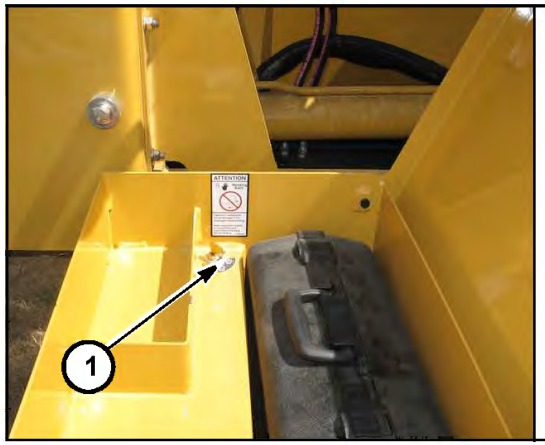
Step 6: Remove battery and install new battery.

Step 7: Apply a light coating of petroleum jelly around base of each terminal.

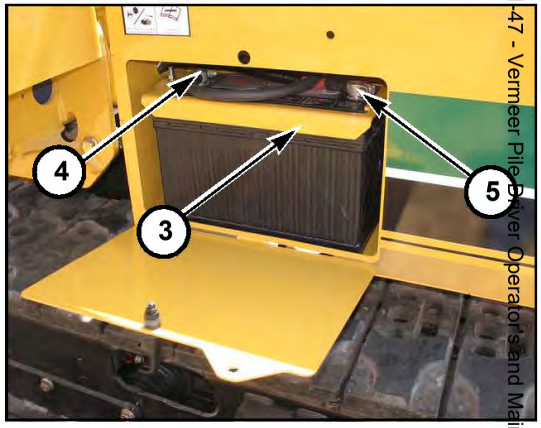
Step 8: Install battery hold-down bracket **(3)**.

Step 9: Install positive (+) cable **(5)** and then negative (-) cable **(4)**. Check that red cap is correctly installed over positive cable clamp.

Step 10: Turn *battery disconnect switch* to connect.

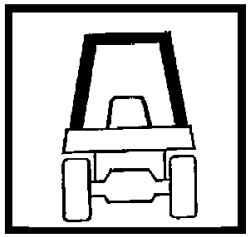






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Rollover Protection Structure (ROPS) – Check



WARNING: The rollover protection structure (ROPS) is intended to protect the tractor operator in the event of a rollover. In order for you to be protected by the ROPS, you must wear seat belts. Follow instructions below relating to ROPS safety precautions.

- Do not remove ROPS.
- Do not modify ROPS in any manner. Unauthorized modifications, such as welding, drilling, cutting, or adding attachments, could weaken the structure and reduce your protection.
- If ROPS has been damaged or subjected to a rollover, replace it. Do not attempt any repairs.
- The roll bars have been certified to a maximum gross machine weight as stated on the ROPS label located on the ROPS. Under no circumstances may total gross machine weight exceed the weight specified on ROPS label.
- If ROPS must be replaced, be sure to use original parts ordered from Vermeer Corporation.

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Wear Pads – Adjust

The slide adjuster material is self-lubricating; the slides are intended to be run dry. Lubrication such as oil or grease may cause dirt to accumulate, which will increase wear. Dry lubricant such as graphite may be used.

To adjust, tighten adjuster bolts to remove clearance between pad and slide frame.

NOTICE: Do not overtighten beyond removing clearance. Overtightening accelerates wear and reduces performance.

Adjust when movement of the black slide rails is greater than 0.06 in (1.6 mm) when tilting the mast to its limits, or when auto plumb is having difficulty.

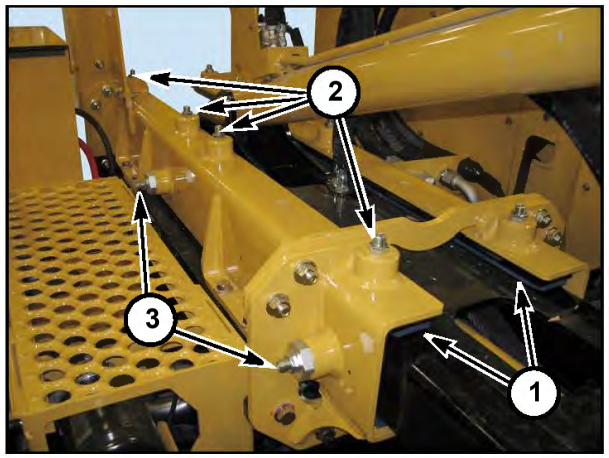
Replace wear pads **(1)** when their thickness is 0.25 in (6 mm) or less.

Base

Tighten bolts (2) (four on each side).

Check wear with mast moved fully rearward.

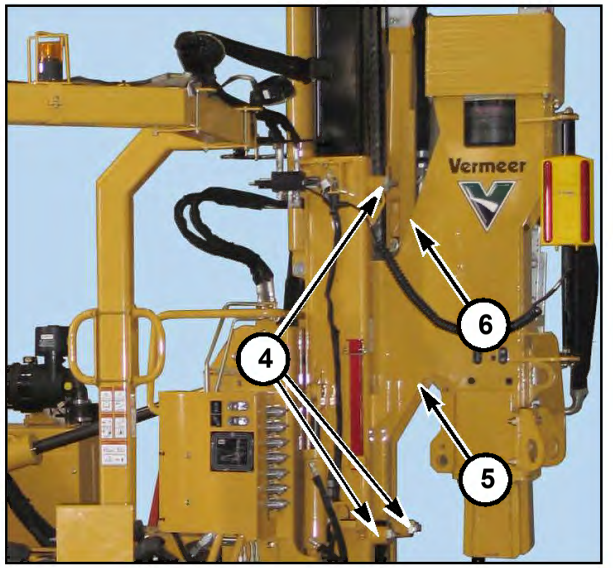
Adjust two bolts **(3)** when base slide moves side-to-side. Adjustment bolts (3) are only on side shown. Other side is welded.



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Mast

Tighten six bolts **(4)** (two on either side of hammer and two on side of mast base) to minimize mast movement as it is raised and lowered.



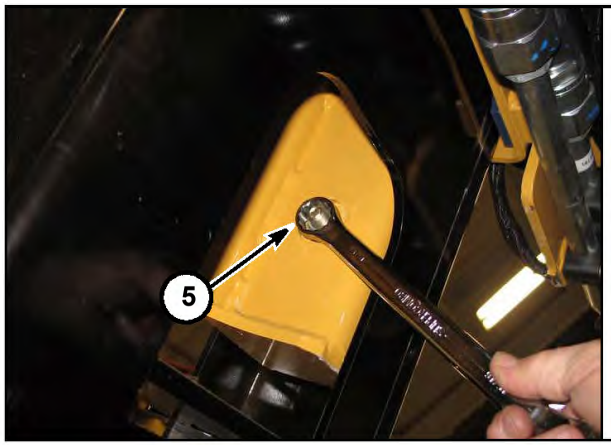
Hammer

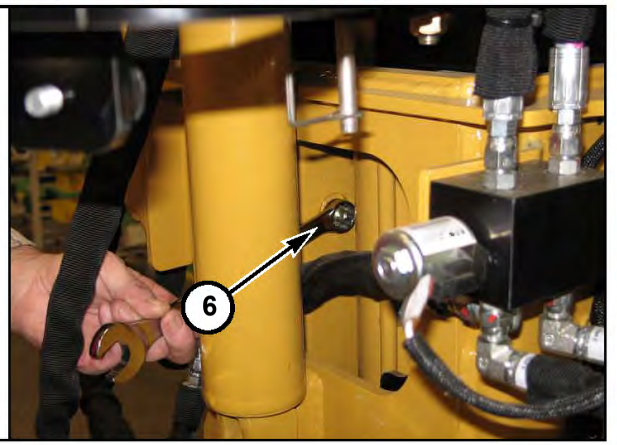
Two adjustment bolts are located inside the mast at top and bottom of hammer, one on each side.

Raise mast fully and install hammer support bar before adjusting two bolts **(5)** on bottom of hammer (shown from bottom of mast).

Lower mast and tilt toward machine partway to adjust two bolts **(6)** on top of hammer.

If the hammer carriage adjusters are overtightened, the hammer will not float or will float too slowly. This decreases hammer performance.



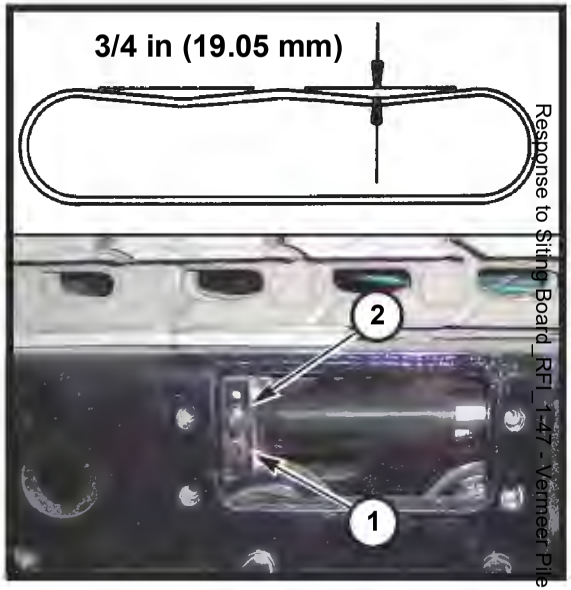


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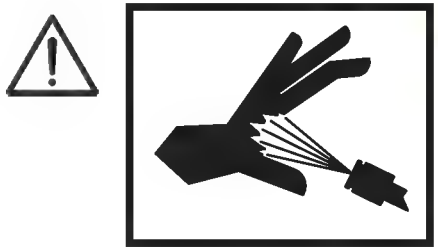
Track Tension – Adjust

Track tension is set with a grease cylinder that compresses a spring against the idler roller.

Remove cover plate (if equipped). With clean tracks, the correct tension is 0.75 in (19.05 mm) of slack when measured as shown.



To increase: Attach grease gun to the fitting on ball check **(1)**, one on each track. Add grease to grease cylinder until track is correctly tensioned.



WARNING: Tensioning system contains grease under pressure. Death or serious injury possible if struck by fitting or if grease is injected under skin. Follow adjustment procedure and wear suitable protective clothing and proper face shield.

To decrease: Slowly loosen Allen screw **(2)** about one-half turn. Track may need to be turned for screw to be loosened. Allow grease to come out until track tension is correct. Tighten screw and clean up expelled grease.

Hammer – Service

Contact your Vermeer dealer.

Mast – Removal

Refer to service manual or contact your Vermeer dealer.

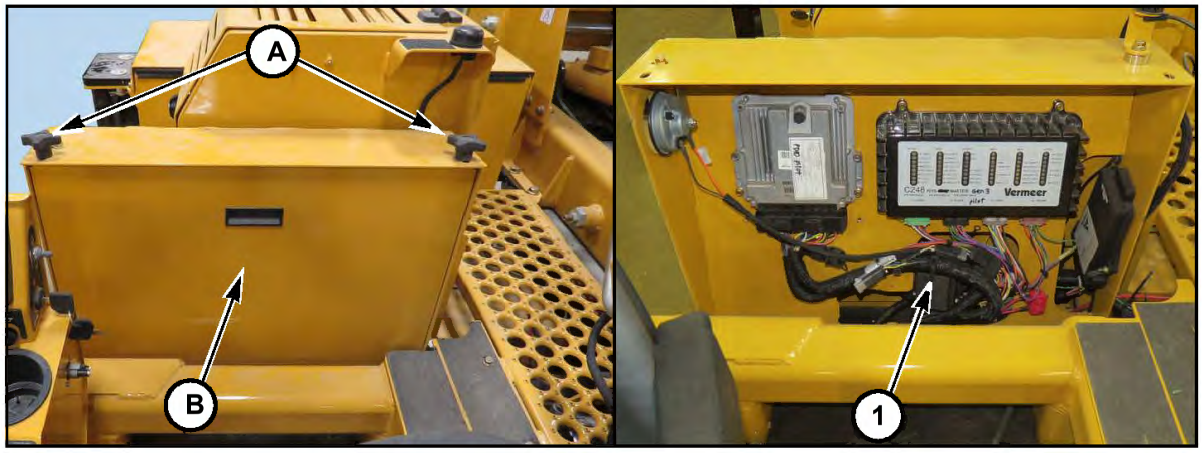
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Fuses and Relays – Replace

Unscrew knobs **(A)** and remove shield **(B)**.

(1) Fuse panel

DP-10 supply 10 amp	C248 supply 25 amp
Tractor supply 10 amp	Remote receiver 10 amp
Telematics supply 5 amp	12 V outlet 15 amp
GPS supply 5 amp	Work lights 10 amp



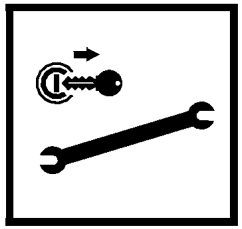
Remote Control Batteries – Replace

Replace remote control batteries as needed. Refer to “Remote Control Batteries,” *page 21-11.*

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Storage

Preparing for Storage



WARNING: Failure to use shutdown procedure can result in unexpected hazard(s). Death or serious injury could result due to entanglement, crushing, cutting, or other hazardous contact. Follow Shutdown Procedure after operating, before performing any service or maintenance, and before transporting. Refer to *Shutdown Procedure, page 23-1*.

- Store machine inside or under cover.
- Fully lower mast and hammer.
- Clean off foreign material and wash machine. Repaint bare metal to inhibit rust.

NOTICE: Machine controls and electrical/electronic devices are not rated to withstand high-pressure water and high temperature power washers. Water intrusion will likely cause malfunction or damage to any devices hit directly by the water spray. Keep pressure washer stream away from machine controls and electrical/electronic devices. Compressed air can also push moisture through some connector and component seals. Do not point air nozzle directly at seal areas.

- Coat exposed cylinder rods with grease.
- Clean and oil chain.
- Grease the machine.
- Repair leaks.
- Repair or replace worn or broken parts
- Replace damaged safety signs and decals.

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- Drain the fuel tank.
- Refer to the Engine Operation Manual for engine storage instructions.
- Disconnect battery cables. If necessary, remove battery. Refer to “Battery - Replace” and store where the temperature will not drop below freezing. Refer to *page 60-58.* Check fluid level and charge fully; recheck every 30 days and charge if necessary.

Removing from Storage

- Remove all protective coverings and grease.
- Fill fuel tank.
- Check engine oil and hydraulic fluid levels.
- Charge battery and install in machine if removed.
- Refer to the Engine Operation Manual for restoring engine to operation.

Cleaning the Machine

Machine controls and electrical/electronic devices are not rated to withstand high-pressure water and high temperature power washers. Water intrusion will likely cause malfunction or damage to any devices hit directly by the water spray. Keep pressure washer stream away from machine controls and electrical/electronic devices. Compressed air can also push moisture through some connector and component seals. Do not point air nozzle directly at seal areas.

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Section 65: Troubleshooting

Percussion Hammer

Symptom	Cause	Solution
Mast auto plumb inoperative	Operator's station not in work position	Pivot operator's station to work mode position.
	Advisory or fault	Contact your Vermeer dealer.
	Valve control not getting signal from joystick	Contact your Vermeer dealer.
	Mast tilt limit out of range	Manually move mast within tilt range. Lower hammer to increase range.
Mast auto plumb failed	Hammer carriage too high on mast	Lower hammer.
	Plumb tolerance too tight	Readjust plumb tolerance.
	Mast pivot or slides loose	Contact your Vermeer dealer.
Hammer does not work	Operator's station in transport mode position	Pivot operator's station to work mode position.
	Valve control not getting signal from joystick	Contact your Vermeer dealer.
	Tool is stuck in hammer	Contact your Vermeer dealer.
	Hammer not sitting on pile	Lower hammer to pile.
	Hammer control dial not working	Contact your Vermeer dealer.
Hammer runs slow	Hammer speed adjustment set low	Adjust hammer speed knob to a higher setting.
	Hammer valve section not working properly	Contact your Vermeer dealer.
	Tool is stuck in hammer	Contact your Vermeer dealer.
	PFC pump controls incorrect	Contact your Vermeer dealer.

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Symptom	Cause	Solution
Hammer will not lift	Float switch in float position	Move switch out of float position.
	Hammer carriage lift chain disconnected	Contact your Vermeer dealer.
	Damaged or worn hydraulic pump	Contact your Vermeer dealer.
Hammer will not float down or is too slow	Float switch not in float position	Move switch to float position.
	Cold hydraulic oil	Warm hydraulic system through operation.
	Improper viscosity oil used for ambient temperature	Warm hydraulic system or change to proper weight oil.
	Hammer carriage slides too tight	Adjust slides. Refer to *page 60-62.*
	Mast is bent	Contact your Vermeer dealer.
Piles will not install on grade using laser receiver	Laser receiver not installed or connected	Install or connect laser receiver.
	“Measure mode” not on	Press “Measure mode” key to turn on.
	Laser receiver not receiving laser signal	Check laser height, location, power, etc. is correct.
		Ensure laser is red.
		Obstruction between laser and receiver
		Ensure receiver is receiving correct laser if there is more than one laser on job site.
Top of pile is deformed beyond use	Pile is too thin for ground conditions	Use appropriate pile for ground conditions
		Adjust central valve on hammer. Contact your Vermeer dealer about this procedure.
	Striker block making uneven contact with pile	Use proper size of guide for size of pile being driven.

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Barrelhead Solar, LLC

Machine

Symptom	Cause	Solution
Will not move with operator's station in transport position	Operator's station proximity switch is faulty, disconnected or out of adjustment	Contact your Vermeer dealer.
	Ground drive joystick not working	Contact your Vermeer dealer.
	Ground drive pumps not working	Contact your Vermeer dealer.
	Operator Presence system not working	Contact your Vermeer dealer.
	Ground drive neutral light not on	Place joystick in neutral.
Will not move with operator's station in work position	Operator's station proximity switch is faulty, disconnected, or out of adjustment	Contact your Vermeer dealer.
	Ground drive joystick not working	Contact your Vermeer dealer.
	Ground drive pumps not working	Contact your Vermeer dealer.
	Operator Presence system not working	Contact your Vermeer dealer.
	Ground drive neutral light not on	Place joystick in neutral.
No hydraulic power	No hydraulic fluid	Fill with fluid.
	Damaged or worn hydraulic pump(s) or motor(s)	Contact your Vermeer dealer.
	Relief valve damaged	Contact your Vermeer dealer.
	Plugged hydraulic filters or strainer	Replace filters or service strainer.
	Pump control system damaged or not functioning	Contact your Vermeer dealer.

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Symptom	Cause	Solution
Slow hydraulic power	Low hydraulic fluid level	Add hydraulic fluid.
	Plugged hydraulic filters or strainer	Replace filters or service strainer.
	Worn hydraulic pump(s) or motor(s)	Contact your Vermeer dealer.
	Hydraulic pump out of adjustment	Contact your Vermeer dealer.
	Wrong hydraulic fluid viscosity	Change hydraulic fluid.
	Hydraulic fluid cold	Let system warm up before operating hydraulics.
Machine moves with joystick in neutral	Hydraulic pump out of adjustment	Contact your Vermeer dealer.
Machine won't move at all	Operator not in seat	Operator sit in seat
	Operator’s station not locked into work or transport position	Pivot operator’s station to work or transport mode position.
	Operator Presence system not working	Contact your Vermeer dealer.
	Ground drive neutral light not on	Place joystick in neutral.
Not tracking straight	Damaged or worn hydraulic pump or motor	Contact your Vermeer dealer.
	One track is over tensioned	Adjust track tension.

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Engine

This troubleshooting list does not cover all possible symptoms. Refer to manufacturer's Engine Operation Manual for a more comprehensive list.

Symptom	Cause	Solution
Engine hard to start or does not start	Ground drive neutral light not on	Place joystick in neutral.
	No fuel	Add fuel.
	Wrong fuel	Use correct fuel.
	Leak in fuel line	Repair fuel line.
	Dirt or water in fuel system	Remove fuel, clean tank, replace fuel filter, and fuel.
	Fuel filter is dirty	Replace fuel filter.
	Wrong weight engine oil	Use correct engine oil.
	Restricted air filter	Replace air filter.
	Fuel injectors dirty	Contact your Vermeer dealer.
	Cold engine	Wait for preheat timer to expire before cranking.
	Low engine cranking speed	Check battery and battery cable(s) condition. Replace/repair as needed.
Engine lacks power	Fuel filter is dirty	Replace fuel filter.
	Restricted air filter	Replace air filter.
	Fuel injectors dirty	Contact your Vermeer dealer.
	Wrong fuel	Use correct fuel.
	Engine is overheated	Contact your Vermeer dealer.

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Low battery charge	Alternator not charging	Contact your Vermeer dealer.
	Worn or damaged alternator drive belt	Tighten or replace belt.
	Loose or corroded battery cables	Clean and tighten cables.
	Defective battery cell	Replace battery.
Remote control will not work	No/low power	Replace batteries.
	Remote not communicating	Register remote.
	Remote locked out	Remove operator from seat.
		Put operator’s station controls in neutral.
		Enable remote with correct key sequence.

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Barrelhead Solar, LLC

Section 70: Specifications

Lubricants

Lubricant/Capacity	Specifications
Engine oil with filter: **Deutz:** 9.5 qt (9 L) **Yanmar:** 7.8 qt (7.4 L)	An Engine Operation Manual is supplied with each machine. Refer to the manual for engine service requirements.
Hydraulic tank: 36 gal (136 L) ***NOTICE:*** Do not spill dirt or other contaminants into the tank. Filter all fluid through a 10-micron filter before adding. ***NOTICE:*** Use of other hydraulic oil without written factory approval jeopardizes warranty.	**ISO 68 Oil**: -10° – 100°F (-23° – 38°C) Vermeer HyPower 68, Shell Tellus T-68, or Mobil DTE16M **[Below 23°F (-5°C), refer to starting procedure]** **ISO 100 Oil**: 10 – 120°F (-12 – 49°C) Vermeer HyPower 100, Shell Tellus T-100, or Mobil DTE18M **[Below 41°F (5°C), refer to Starting Procedure]**
Grease	**EP grease**: Vermeer LC Ultra or equivalent
Hammer grease	Chisel paste
Planetary oil: all-purpose gear lube 31 oz (920 ml) per planetary; 62 oz (2 L) total	Oils must conform to API GL5 or MIL-L-2105D specifications. -20 – 100°F (-29 – 38°C): 80W-90 20 – 120°F (-7 – 49°C): 85W-140
Coolant: **Deutz:** 1.7 gal (6.4 L) **Yanmar:** 1.5 gal (5.7 L)	Use a 50/50 mixture of Extended Life (ELC) Nitrite-Free (NF) coolant and distilled or deionized water. Never add pure antifreeze to the system; always dilute to a 50/50 mixture. Never use Supplemental Cooling Additives (SCAs) with ELC coolant. Refer to the Engine Operation Manual.
Lift chain lubricant	Dry spray lubricant

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Machine Specifications

Deutz Engines				
Model	Deutz D2.9L4 Tier 4 Final/Stage IIIA	Deutz D2.9L4 Tier 4 Interim/Stage IIIA	Deutz TD2.9L4 Tier 4 Interim/Stage IIIB	Yanmar 4TNV88 Tier 4 Interim/Stage IIIB
Maximum power (net)	49 hp (37 kW) at 2,600 rpm		67 hp (50 kW) at 2,600 rpm	47 hp (35 kW) at 3,000 rpm
Fuel capacity	28 gal (106 L)			
Fuel type	Tier 4 engines require Ultra Low Sulfur Diesel (ULSD) fuel, with sulfur content less than 15 ppm (15 mg/kg). Use of fuels other than what is specified in the engine manual will impact engine performance, damage engine emissions systems and may result in engine and exhaust system warranty being voided.			
Maximum engine inclination	30° all directions ***NOTICE:*** Maximum engine inclination angle does not indicate safe machine operating angle.			
Battery (1)	12-volt negative ground, 950 cold cranking amps, 30 sec @ 0°F (-18°C) Reserve capacity: 195 min. of 25-amp output @ 80°F (27°C)			
Hydraulic pump	Sauer Danfoss H1 hydrostatic			

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Remote Controls		
Model	R524J 6-Button	
Batteries / life	Six – AA / 40 hours	
Normal range	100 ft (30 m)	
Maximum recommended range	300 ft (91 m)	
Maximum oil flow	27 gpm (102 L/min)	
Maximum pile dimension	**Standard Opening – 170 mm:** Round: 7.2 in (18.3 cm) diameter Square: 6.2 in (15.8 cm) Rectangular: 4.6 x 7.2 in (11.7 x 18.3 cm)	**Large Opening – 225 mm:** Round: 9.3 in (23.6 cm) diameter Square: 8.3 in (21.1 cm) Rectangular: 6.7 x 9.3 in (17 x 23.6 cm)
Hammer		
Hammer energy class	738 ft-lb (1000 J), 1,500 blows per minute maximum ***NOTICE:*** Do not use hammer without pile or post.	
Working pressure	1,700 psi (117 bar)	
Minimum oil flow	14 gpm (53 L/min)	
Maximum oil flow	27 gpm (102 L/min)	
Maximum pile dimension	**Standard Opening – 170 mm:** Round: 7.2 in (18.3 cm) diameter Square: 6.2 in (15.8 cm) Rectangular: 4.6 x 7.2 in (11.7 x 18.3 cm)	**Large Opening – 225 mm:** Round: 9.3 in (23.6 cm) diameter Square: 8.3 in (21.1 cm) Rectangular: 6.7 x 9.3 in (17 x 23.6 cm)
Laser (Option)		
Laser receiver	Trimble LR410	
Operating distance	1,500 ft (457.2 m) maximum	

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Operational Dimensions

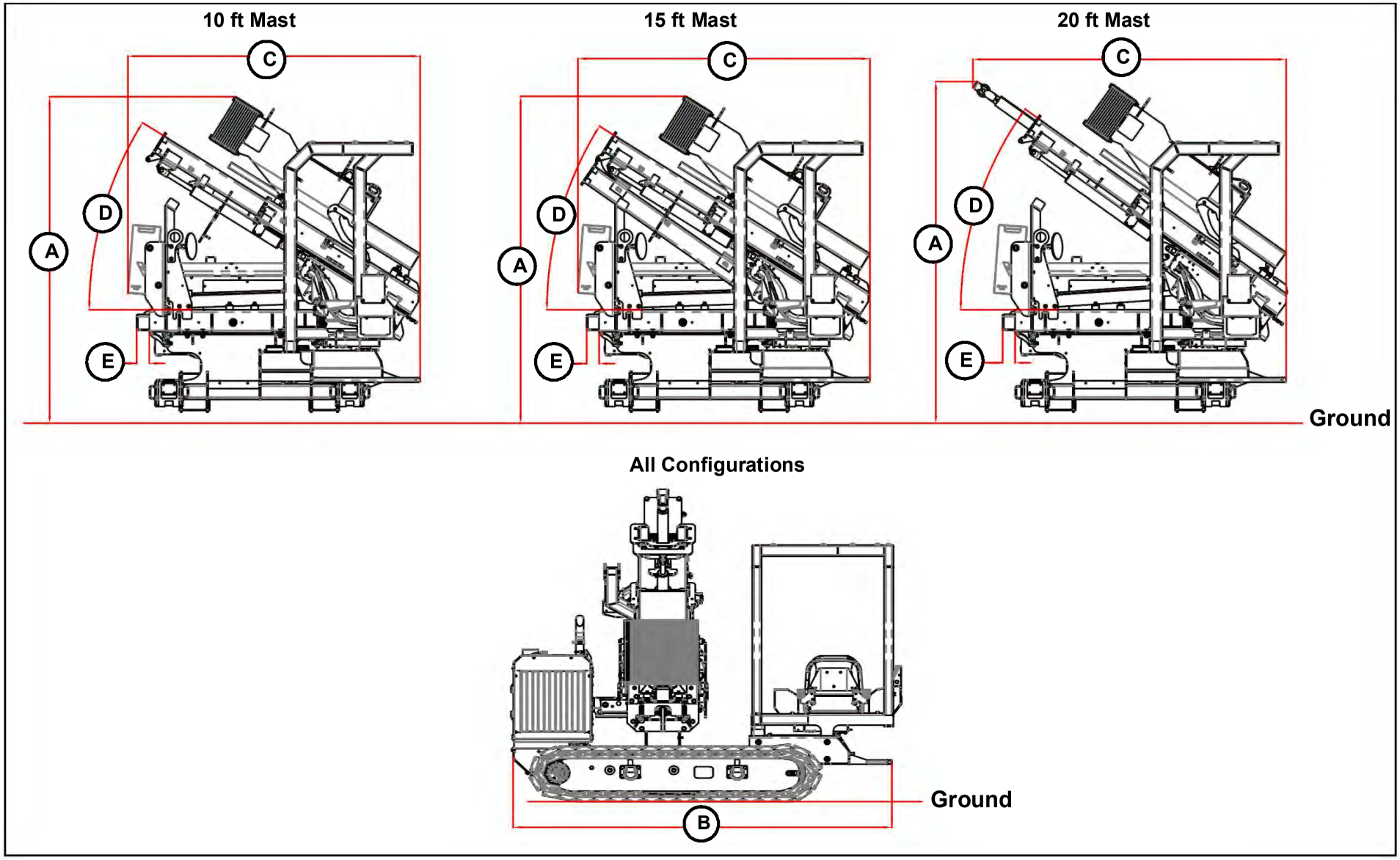
	10 ft (3.1 m) Mast	15 ft (4.6 m) Mast	20 ft (6.1 m) Mast
Max. Operating Height (max. height may increase with installation of a compatible third-party GPS system)	179 in (455 cm)	239 in (607 cm)	299 in (760 cm)
Max. Operating Length	122 in (310 cm)		
Min./Max. Operating Width	121 in (307 cm) / 145 in (368 cm)		
Machine Weight	14,135 lb (6412 kg)	14,320 lb (6 495 kg)	15,590 lb (7 072 kg)
Composite mast/hammer frame weight (pivot frame, hose carrier, mast base, hammer carriage w/ hammer, lower mast	2717 lb (1232 kg)	2,917 lb (1 323 kg)	3,127 lb (1 418 kg)
Mast Angle (front/back)	5° front/back with hammer low; 5° front/20° back with hammer high		
Mast Angle (left/right)	11° hammer low/5° hammer high		
Mast Extension	NA	5 ft (1.5 m)	2 pieces at 5 ft (1.5 m) = 10 ft (3 m)
Max. Pile Height	10 ft (3 m)	15 ft (4.6 m)	20 ft (6.1 m)

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Transport Dimensions

	10 ft (3.1m) Mast	15 ft (4.6 m) Mast	20 ft (6.1 m) Mast Bottom section removed and hose carrier lowered.	20 ft (6.1 m) Mast With tilt cylinder positioner and hose carrier lowered.
Max. Transport Height **(A)**	108 in (274 cm)			112 in (284 cm)
Max. Transport Length **(B)**	122 in (310 cm)			
Max. Transport Width **(C)**	98.7 in (251 cm)	94.3 in (240 cm)	101.5 in (258 cm)	100.5 in (255 cm)
Lateral Mast Tilt Angle **(D)**	32°			38°
Lateral Mast Slide Length **(E)**	8.5 in (21.6 cm)		7.5 in (19.1 cm)	8.5 in (21.6 cm)
Reference illustration on next page.				

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Counterweights

Weight Configuration for S/N 1001 – 2000

Configuration for 10-ft Mast Machine

Requires standard weight kit **(1)**.

Configuration for 15-ft Mast Machine

Includes standard weight kit **(1)** and adds either a second row of weights **(2)**, or weights on track frame **(3)**.

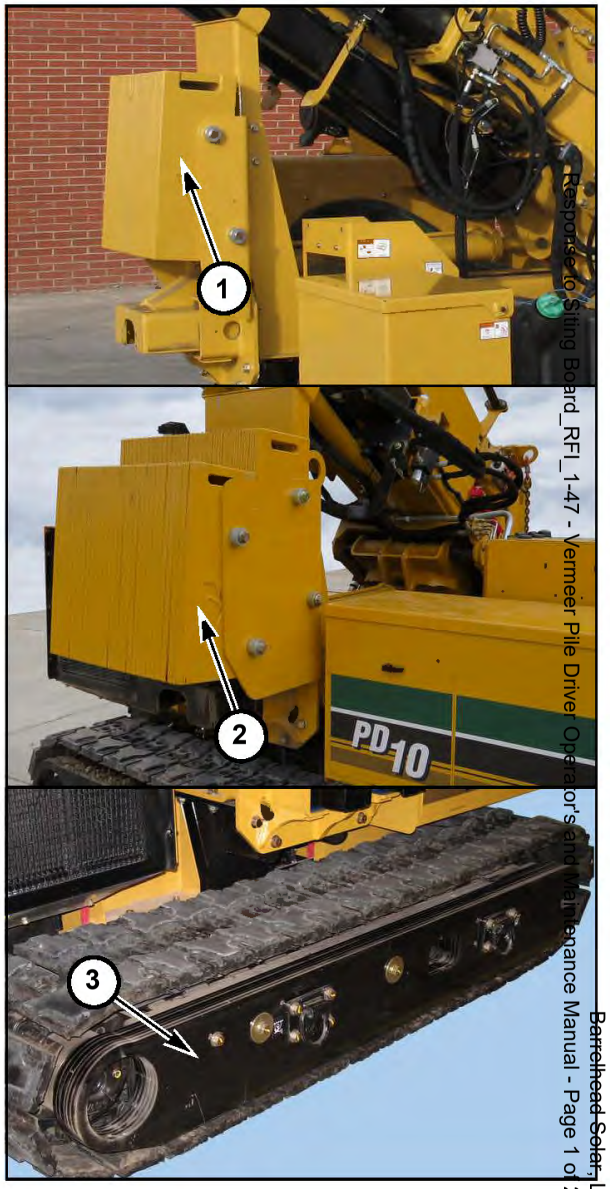
Configuration for 20-ft Mast Machine

Requires standard weight kit **(1)** and undercarriage weights (not shown).

Weight Configuration for S/N 2001 –

All configurations require standard weight kit **(1)** and undercarriage weights (not shown).

Weights on track frame **(3)** are required for 20-ft mast, in addition to single row of weights **(1)**, and undercarriage weights (not shown).



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Revision History

Revision	Date	Page(s)	Description
o-m1_00	05/12	All	Production manual released.
o-m2_00	07/13	All	Second edition production manual
o-m2_05	12/19	Front, Section 16, 30-5, 30-6, 30-7, 30-10, 30-11, 30-12, 30-14, 40-10, Section 60, 70-1	Updated safety graphics, warranty, corrected Yanmar oil capacity, moved Welding Statement to Maintenance section, updated for new telematics, updated transporting machine section.
o-m2_06	12/20	Receiving and Delivery vi, Section 15-1, Section 20-1, 20-21, 20-29, 20-30, 20-31, 20-37, 20-38, Section 21 all, Section 50-12 through 21, Section 22-4, Section 23-1, Section 60-2, 60-7, 60-54, Section 70-3.	Updated remote controller picture in Receiving and Delivery. Added new operator note. Added remote control messages and location of remote control. Added inclinometer information. Updated Section 21. Added 60 second delay and low idle notes. Added remote control test at 100 hours maintenance. Added note for replacing remote batteries. Added remote control specs.
o-m2_07	04/22	Front, 30-16, 30-18, 60-3, 60-12, 70-1, 70-2, Back	Updated tow point, fuel tank, controller change, engine oil capacity
o-m2_08	02/23	All	Updated to style guide, updated GPS antenna mount location
o-m2_09	12/23	All	USB video, planned maintenance, hammer lift roller, style guide updates
o-m2_10	05/25	Front, 60-12, 13, 14, 33,	Updated introduction boiler plate, hammer lift roller, hammer lifting chain, hammer chain nut

When operated in California, any off-road diesel vehicle may be subject to the California Air Resources Board In-Use Off-Road Diesel Vehicle Regulation. It therefore could be subject to retrofit or accelerated turnover requirements to reduce emissions of air pollutants. For more information, please visit the California Air Resources Board website at http://www.arb.ca.gov/msprog/ordiesel/ordiesel.htm.

CALIFORNIA
Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

CALIFORNIA
Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

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Pella, Iowa 50219-0200 USA

Siting Board 1-48:

Refer to the SAR, Appendix E, Noise Analysis, at 12-14.

a. State whether the estimate of 84 dBA at 50 feet for pile driving is for the specific pile driver to be used on this project (Vermeer PD10).

b. Provide supporting documentation for this estimate from within the last five (5) years, such as the manufacturer's specification sheet including sound output.

c. Provide a revised Table 5 with the pile driving column updated for each receptor based on sound output levels from the supporting documents.

Response:

a. An estimate of 84 dBA at 50 feet for the Vermeer PD10 pile driver was previously used to characterize the sound levels experienced by receptors. However, Barrelhead Solar received updated (2025) information on the PD10 from Vermeer and has revised the Noise Analysis, which is provided as Attachment 1-46.

b. The 2025 Vermeer PD10 pile driver operators manual is provided as Attachment 1-47 (see page 40-6 for noise information).

c. The revised report (Attachment 1-46) includes an updated Table 5 reflecting the sound levels published by Vermeer in 2025.

Witness: Marty Marchaterre

Siting Board 1-49:

Provide noise contour maps for the 2,000-foot area surrounding Project boundaries during Project construction and operations, accounting for all Project components and noise receptors.

Response: Barrelhead Solar is preparing a noise contour map and will submit it upon completion.

Witness: Marty Marchaterre

Siting Board 1-50:

State the number of acres of trees that will be cleared from the Project site and identify the areas where tree clearing will occur.

Response: Approximately 13.51 acres of trees would be cleared for Project construction. A figure has been developed and is included as Attachment 1-95.

Witness: Marty Marchaterre

Siting Board 1-51

Refer to the Application, Attachment A, Context Maps and the SAR, Appendix B, Preliminary Site Layout. It appears that the Project boundary on the southwest side is different between the two documents. Confirm the full Project boundary and identify with a corrected map.

Response: The 2-mile vicinity Context Maps in the Application, Attachment A show the correct Project boundary. The revised Preliminary Site Layout is provided as Attachment 1-23 and has been corrected.

Witness: Marty Marchaterre

Siting Board 1-52:

Provide a photo or visual rendering of the perimeter fencing.

Response: The perimeter fencing will be a standard 6-foot metal, chain-link fencing with barbed wire at the top to deter climbing. A representative image is below:



Witness: Marty Marchaterre

Siting Board 1-53:

Refer to the SAR, Appendix F, Landscape Plan. Explain how the specific locations identified for vegetative screening were chosen.

Response: Barrelhead Solar and its consultants visited the Project Area and evaluated existing vegetation, terrain, viewsheds, and areas of potential high visibility. Other resources, such as Google Earth, Google Street View, and an interactive topography map of Kentucky were reviewed.

Witness: Marty Marchaterre

Siting Board 1-54:

Refer to the SAR, Appendix F, Landscape Plan. Explain why no vegetative screening is proposed for the following areas:

a. Along the panels in the southwestern portion of the Project site to shield the structures located to the south of the proposed substation.

b. Along the eastern side of the panels in the northeastern section of the Project site (near the proposed pollinator garden), to shield the home on the south side of KY-1009.

Response:

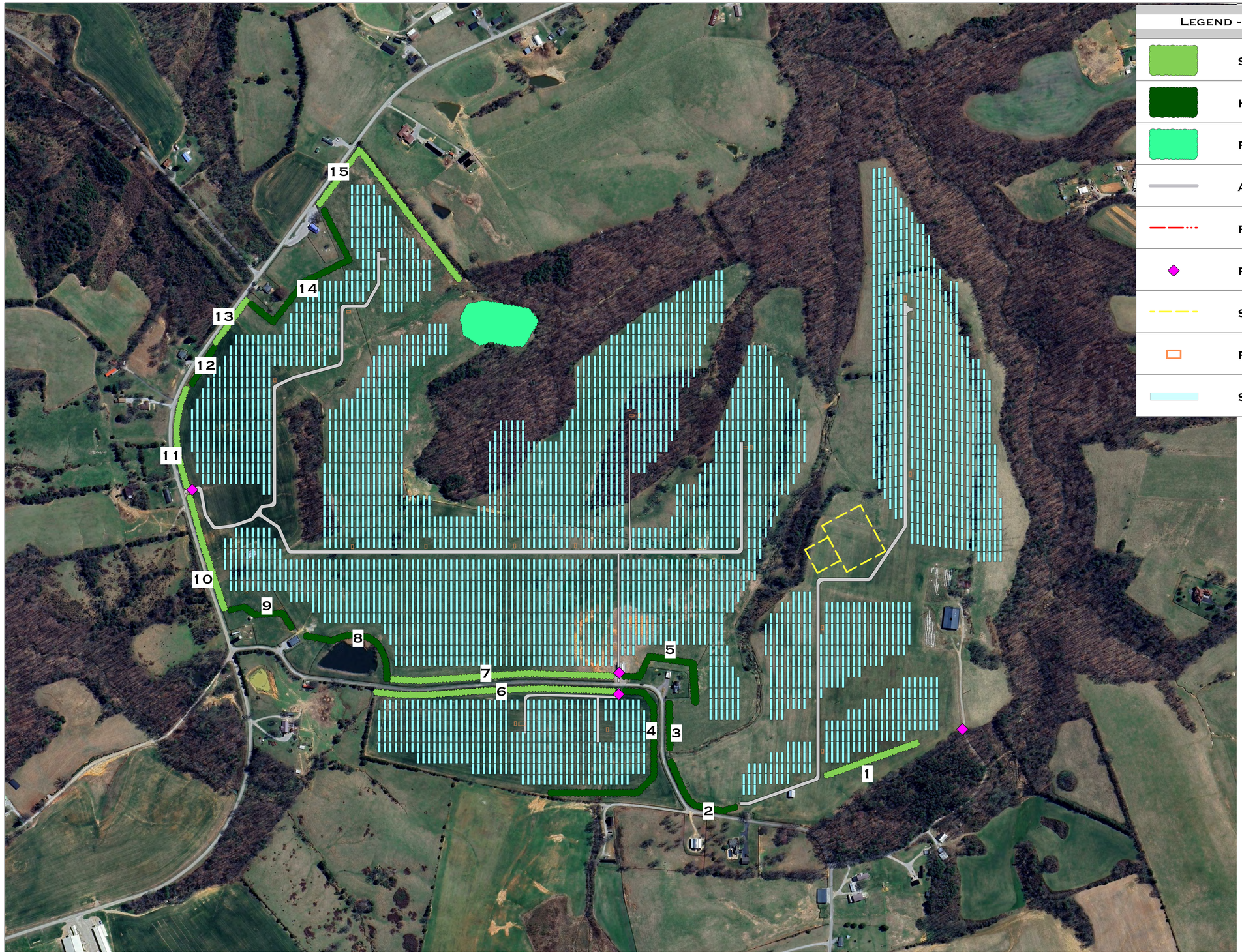
a. South of the substation are barns that are within the project boundary. The southernmost line of panels is planned at an elevation of 900'. Just south of those panels is a wooded area along Potts Creek, which appears to be composed of a mixture of evergreen and deciduous trees. Beyond Potts Creek is a residence that sits on a hill with an apparent ground elevation of approximately 965', with an additional 5' to account for eye level and 10' for a second story, if there is one, resulting in a total elevation of approximately 980' above sea level. The edge of the woods north of this residence is approximately 920' msl, which is approximately 50' lower than eye level and 60' or lower than a second-story window. Because of the elevation of this home, it is unlikely that the proposed landscape plan will completely block the view of the Project from this home.

As discussed in the November 12, 2025 Motion for Deviation from Setback Requirements, a substantial forested area exists between the two residential neighborhoods and the Project Site. For Residential Neighborhood 1, the forested area between each residence and the nearest solar panel ranges from 839 feet to 989 feet (or 48.82% and 61.93% of total distance). For Residential Neighborhood 2, the forested area between each

residence and the nearest solar array ranges from 866 feet to 1,285 feet (59.15% and 85.35% of total distance).

b. Barrelhead Solar is unsure of the Staff's request, as landscaping has been proposed along the entire northeastern portion of the Project Area. The compass on the provided landscape plan was not correct, which is potentially causing confusion in the request. A revised map with a correct compass has been provided as Attachment 1-54.

Witness: Marty Marchaterre



Legend - Landscape Plan

- Standard Screening
- Heavy Screening
- Pollinator Meadow
- Access Roads
- Project Boundary
- Points of Access
- Substation
- Power Inverters
- Solar Panels

N

DEARBORN & ASSOCIATES
LANDSCAPE ARCHITECTURE | PROJECT MANAGEMENT | CONTRACTING

Project Area:
Preliminary Landscape

Client Name and Address:
Barrelhead Solar
Wayne County Kentucky

Date:
11/20/25

Scale:
1:3000

LS-1

1 Site Overview
Scale: 1:3000

0 500 1000 ft

PLANT LEGEND

CC
Cercis canadensis
Eastern Redbud

CR
Cornus racemosa
Gray Dogwood

JV
Juniperus virginiana
Eastern Red Cedar

PS
Pinus strobus
Eastern White Pine

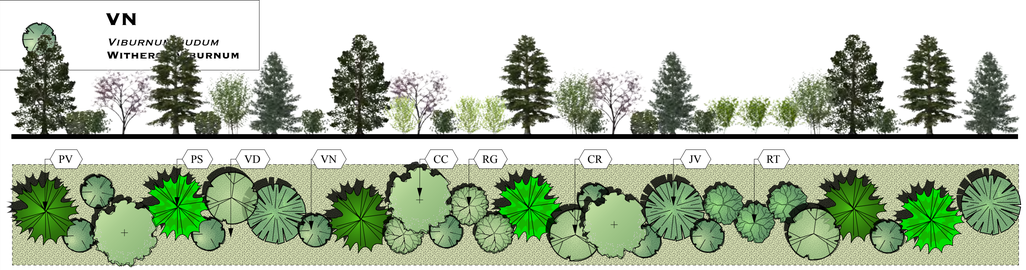
PV
Pinus virginiana
Virginia Pine

RG
Rhus glabra
Smooth Sumac

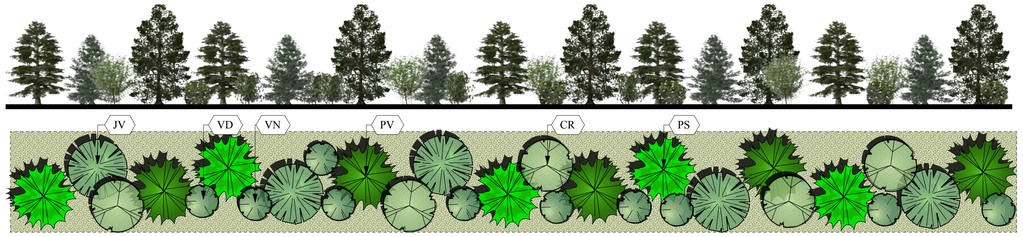
RT
Rhus typhina
Staghorn Sumac

VD
Viburnum dentatum
Arrowwood Viburnum

VN
Viburnum nudum
Witherod Viburnum



2 **Standard Screening**
Scale: 1" = 20'-0"



3 **Dense Screening**
Scale: 1" = 20'-0"

0 50 100 ft

Quantities by Segment

Total Qty	Symbol	SEGMENT: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SF		17078	16458	8467	19081	23051	41337	38427	20085	12504	20668	17846	7947	9606	32319	12235
Acres		0.392	0.378	0.194	0.438	0.529	0.949	0.882	0.461	0.287	0.474	0.410	0.182	0.221	0.742	0.281
Linear Feet		569	549	282	636	768	1378	1281	670	417	689	595	265	320	1077	408
Conifers																
138	JV	5	8	4	20	12	13	12	10	6	6	6	4	3	17	12
138	PS	5	8	4	20	12	13	12	10	6	6	6	4	3	17	12
138	PV	5	8	4	20	12	13	12	10	6	6	6	4	3	17	12
414		**15**	**24**	**12**	**60**	**36**	**39**	**36**	**30**	**18**	**18**	**18**	**12**	**9**	**51**	**36**
Shrubs																
57	CC	5	0	0	0	0	13	12	0	0	6	6	0	3	0	12
138	CR	5	8	4	20	12	13	12	10	6	6	6	4	3	17	12
57	RG	5	0	0	0	0	13	12	0	0	6	6	0	3	0	12
57	RT	5	0	0	0	0	13	12	0	0	6	6	0	3	0	12
138	VD	5	8	4	20	12	13	12	10	6	6	6	4	3	17	12
197	VN	11	8	4	20	12	26	24	10	6	12	12	4	6	17	25
644		**36**	**24**	**12**	**60**	**36**	**91**	**84**	**30**	**18**	**42**	**42**	**12**	**21**	**51**	**85**
1058	**TTL**	**51**	**48**	**24**	**120**	**72**	**130**	**120**	**60**	**36**	**60**	**60**	**24**	**30**	**102**	**121**

Plant Schedule

	ID	Qty	Common Name	Botanical Name	Plant Zones	Mature Height	Mature Width	Growth Habit	Scheduled Size
Conifers									
	JV	138	Eastern Red Cedar	*Juniperus virginiana*	3| 4| 5| 6| 7| 8| 9	35 - 50 ft	12 - 20 ft	Pyramidal	4-5' B&B / Container
	PS	138	Eastern White Pine	*Pinus strobus*	3| 4| 5| 6| 7| 8| 9	50 - 80 ft	12 - 20 ft	Pyramidal	5-6' B&B / Container
	PV	138	Virginia Pine	*Pinus virginiana*	4| 5| 6| 7| 8	15 - 35 ft	12 - 20 ft	Irregular	4-5' B&B / Container
Shrubs									
	CC	57	Eastern Redbud	*Cercis canadensis*		5| 6| 7| 8| 9	20 - 35 ft.	20 - 35 ft.	Round	4-5' B&B / Container
	CR	138	Gray Dogwood	*Cornus racemosa*	3| 4| 5| 6| 7| 8	7 - 12 ft	7 - 12 ft	Rounded	3' B&B / Container
	RG	57	Smooth Sumac	*Rhus glabra*	2| 3| 4| 5| 6| 7| 8| 9	7 - 12 ft	7 - 12 ft	Rounded	3' B&B / Container
	RT	57	Staghorn Sumac	*Rhus typhina*	4| 5| 6| 7| 8	12 - 20 ft	12 - 20 ft	Spreading	3' B&B / Container
	VD	138	Arrowwood Viburnum	*Viburnum dentatum*	2| 3| 4| 5| 6| 7| 8	4 - 7 ft	4 - 7 ft	Upright	3' B&B / Container
	VN	197	Witherod Viburnum	*Viburnum nudum*	5| 6| 7| 8| 9	7 - 12 ft	7 - 12 ft	Oval	3' B&B / Container

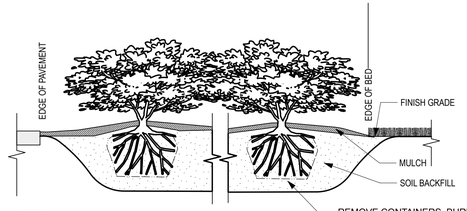
Vegetative Screening Notes:

Shrub and Tree Installation

1. The contractor is responsible for the accurate layout of all work as outlined in these plans.
2. All plant materials, unless specified otherwise, should have uniform branching and a strong, healthy root system. They must be free of defects, diseases, insect infestations, decay, pest eggs, or any signs of infestation. The plants should be in good health, show no transplant shock or visible wilting, and be fresh. Any plants that appear unhealthy will be rejected.
3. All plant materials must meet the minimum requirements and standards outlined in the latest edition of "The American Standard for Nursery Stock" published by the American Association of Nurserymen, 1250 I Street, N.W., Suite 500, Washington, D.C. 20005.
4. All container-grown stock must have been propagated in a container long enough for the root system to be sufficiently developed, allowing it to retain its soil. Any container stock with underdeveloped roots will be rejected.
5. Plants must be prepared for shipment in a manner that ensures no damage to the bark, buds, branches, stems, or overall form of the stock. Container-grown plants should be transported in the containers they were grown in.
6. If plants are not installed on the same day they arrive at the site, the contractor must store and protect them. Storage areas should be shaded and shielded from wind and sun. While on-site, plants should be kept moist by covering the balls or roots with wet burlap, moist sawdust, wood chips, shredded bark, peat moss, or other approved materials to prevent drying out.
7. Plant substitutions may be made if necessary, based on availability, but must match the size and landscape (screening) value of the original plants. All substitutions must be approved by the owner or the owner's representative.
8. The contractor is responsible for verifying all dimensions on-site.
9. Planting shall not take place when the soil is frozen.

Planting Procedure:

- Dig the planting hole at least twice the width of the rootball for the first 12 inches of depth. Below 12 inches, widen the hole enough to allow for adjustment, but do not exceed the rootball's depth measured from base of root flare to bottom of ball.
- Holes for individual plantings should have vertical sides and a flat bottom. Ensure the sides and bottom of the planting hole are roughened or scarified.
- Lift and position the tree by the rootball only—do not lift by the trunk or use the trunk as leverage.
- Remove all foreign or non biodegradable material from root ball including top 1/3 of wire basket.
- Ensure burlap and twine is pulled away from trunk and any excess burlap removed.
- Backfill with soil that has been well-tilled or broken up to ensure proper settling.
- Pruning should be limited to the removal of dead, diseased, or broken limbs and must follow ANSI A300 specifications.
- Remove any remaining trunk wrap at planting and avoid placing any wraps around the trunk.
- The contractor is responsible for restoring areas disturbed during the installation of shrubs and trees.



NOTES
1. PROVIDE MULCHED CIRCULAR SAUCER FOR INDIVIDUAL PLANTS.
2. ROOT FLARE SHOULD BE VISIBLE AT BASE.

Project Acceptance, Maintenance, and Warranty:

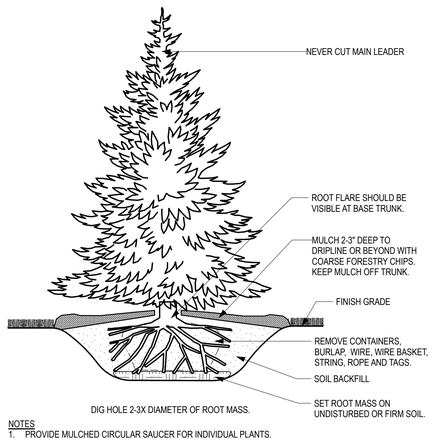
1. Plant areas will be inspected upon completion of installation and will receive initial acceptance if they meet the specified materials and installation requirements. Once the complete installation of all plant material is initially accepted, the warranty period will commence.
2. The contractor is responsible for maintaining the installed shrubs and trees within the project limits until final acceptance of the project by the engineer, which occurs at the end of the warranty period. Maintenance responsibilities include pruning, cultivating, weeding, watering, and ensuring plants remain free from insect infestations, diseases, and other damage from herbivores until final acceptance. The maintenance period will continue throughout the warranty period.
3. The contractor warrants that plant material will remain alive and in healthy, vigorous condition for one (1) year following the initial acceptance. If planting occurs over multiple planting windows, the warranty will apply to all plant material based on the warranty period of the most recently installed plants.
4. All plants deemed unsatisfactory by the owner's representative during the initial planting installation must be removed and immediately replaced.
5. Any plants that are dead or severely unhealthy, as determined by the owner's representative, within the warranty period must be replaced immediately, following the drawings and specifications. These replacements are at the contractor's expense and should be installed during the next suitable planting season.
6. Tree staking should be removed after one full growing season. If staking is necessary for replaced warranty plants, these stakes must be removed after one full growing season following their installation.
7. The contractor is responsible for providing herbivory protection throughout the maintenance and warranty period. Any plants replaced due to herbivory damage will be at the contractor's expense.
8. Upon final acceptance, plant maintenance responsibilities will be transferred to the owner.

PROJECT MEASUREMENT AND PAYMENT:

1. Payment for planting will be based on the actual number of individual plants that are installed and maintained.
2. All work under this item will be compensated at the contract unit price per plant. This price constitutes partial payment (90%) for all associated work, including materials, labor, warranty, and any other incidental items up to initial acceptance. The remaining 10% will be paid upon final acceptance, following the completion of the warranty period.

NOTES:

1. Mature height, spread, and average annual growth are approximate. Actual size and growth rates may vary.
2. Project is located in USDA planting zone 7a (Livingston County, Kentucky)
3. Plant species shown reflect the design intent. Substitutions may be made based on the availability of local nursery stock. The contractor may propose alternative species, subject to approval by the landscape architect.



NOTES
1. PROVIDE MULCHED CIRCULAR SAUCER FOR INDIVIDUAL PLANTS.
2. GUYING AND STAKING TO BE DETERMINED IN THE FIELD BY THE LANDSCAPE ARCHITECT. LOCAL FIELD CONDITIONS AS WELL AS PLANT CHARACTERISTICS WILL DETERMINE THE NECESSITY OF GUYING AND STAKING.
3. TYPICALLY ONLY TREES WITH A 3" OR GREATER CALIPER NEED TO BE STAKED. TREES WITH LESS THAN A 3" CALIPER NEED TO BE STAKED ONLY AS A REQUIRED BY LANDSCAPE ARCHITECT.

DEARBORN & ASSOCIATES
LANDSCAPE ARCHITECTURE | PROJECT MANAGEMENT | CONTRACTING

PRELIMINARY LANDSCAPE

PROJECT AREA:

CLIENT NAME AND ADDRESS:
BARRELHEAD SOLAR
WAYNE COUNTY KENTUCKY

DATE:
11/20/25

SCALE:
AS NOTED

LS-2

Siting Board 1-55:

Provide a narrative description of the difference between standard screening and heavy screening.

Response: The "heavy" screening has a higher percentage of evergreens and fewer small trees/shrubs, and no sumac. Please see the chart labeled "Quantities by Segment" in the Landscape Plan (Attachment 1-54).

Witness: Marty Marchaterre

Siting Board 1-56:

Provide visual renderings of Project facilities without and with vegetative screening at locations around the Project site.

Response: Visual renderings are being prepared and will be submitted when completed.

Witness: Marty Marchaterre

Siting Board 1-57:

Refer to the SAR, Section 6, Mitigation Measures, Item 12. State whether the Applicant will monitor all planted vegetation on an on-going basis and commits to replacement of vegetative buffers, as necessary, over the entire 40-year life of the Project.

Response: Yes, Barrelhead Solar will monitor all planted vegetation on an ongoing basis and is committed to replacing vegetative buffers, as necessary, over the entire life of the Project.

Witness: Marty Marchaterre

Siting Board 1-58:

Refer to the SAR, Appendix F, Landscape Plan.

a. Confirm that Barrelhead Solar will be responsible for maintaining the pollinator meadow throughout the life of the Project. If not, identify the responsible party.

b. Explain what would be included as part of maintenance activities.

Response:

a. Barrelhead Solar will maintain pollinator meadows throughout the life of the Project.

b. Pollinator area vegetation management will occur as part of maintenance. Maintenance activities will include mowing, weed control, and supplemental seeding.

- **Mowing** during the maintenance phase acts as a disturbance needed and prevents encroachment or natural succession. Mowing is often conducted at a higher height (e.g., 9 to 12 inches from the ground, rather than cutting it short, to protect the plants and the soil. The frequency of mowing during the maintenance phase is often reduced to just once or twice a year or longer and is typically rotational (i.e., only a section of each pollinator or meadow area is mowed at a time).
- **Weed and woody vegetation control** is necessary to prevent invasive and noxious plant species and woody vegetation. Manual removal or targeted spot treatment with herbicides can be used for problem areas, but broad use of herbicides should be avoided.
- **Supplemental seeding** may be necessary where desired solar pollinator vegetation has not yet reached required coverage or where site disturbance has

occurred. Similar to mowing, the need for supplemental seeding during the maintenance phase is infrequent.

Witness: Marty Marchaterre

Siting Board 1-59:

Refer to the SAR, Appendix G, Visual Impact Report. The residential receptors located at 1837 KY 1009 N (next to the church) and at 475 Massingale Road were not included in the report or figures. Provide a revised Visual Impact Report that includes these residences.

Response: The two residential receptors identified were initially excluded from the analysis because they are participating properties. A revised Visual Impact Report is included as Attachment 1-59.

Witness: Marty Marchaterre

COPPERHEAD
ENVIRONMENTAL CONSULTING

Barrelhead Solar Facility Viewshed Methodology and Analysis



Prepared For:

Barrelhead Solar, LLC

Prepared By:

Kim Rhodes

Environmental Planner

24 November 2025

COPPERHEAD ENVIRONMENTAL CONSULTING, INC.
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ANALYSIS ASSUMPTIONS **3**

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LIST OF TABLES

Table 1. Number of Receptors by Level of Visibility of the Project. 4

Table 2. Modeled Visibility Results at Each Receptor (where visibility is greater than zero). 5

Appendices

Appendix A: Visibility Analysis Result Maps

INTRODUCTION

Barrelhead Solar, LLC (the Applicant) is proposing the construction of an approximately 54 megawatt (MW) alternating current (AC) solar energy facility (the Project) in Wayne County, Kentucky. The Project would be situated on approximately 307 acres of private land and is located on KY 1009 and Massingale Road, southwest of the city of Monticello, Kentucky.

This viewshed analysis uses Geographic Information Systems (GIS) to attempt to quantify levels of potential visibility for residences within 2,000 feet of the Project (analysis area). The results of the analysis are summarized in this report and displayed in maps found in Appendix A. A viewshed analysis illustrates the predicted visibility that potentially may be expected for a project. It allows one to determine whether and where an object, such as solar arrays, can geographically be seen within a larger regional area. The viewshed model accounts for topography, vegetation, and the general height and surface of the Project infrastructure. Other assumptions used in the analysis are described later in this report.

PROJECT AREA SETTING

The Project Area is currently a mosaic of agricultural and pasture lands in addition to deciduous and mixed forest. The setting in the analysis area is rural. Existing infrastructure within the Project Area includes common features, such as roads, state highways, and electrical and utility transmission. Scattered residential homes, as well as some commercial businesses, surround the Project Area.

Within the analysis area, none of the following occur:

- Wild, scenic, or recreational rivers
- Scenic districts or roads, including areas that may be under a scenic easement or locally designated historic or scenic districts and scenic overlooks
- Parks (federal, state, or local), Recreation Areas, or Wildlife Management Areas
- Historic resources listed or eligible for listing on National or State Registers of Historic Places

A stream and wetland delineation performed by Copperhead Environmental Consulting, Inc. (Copperhead) identified 12 wetlands, 22 streams, and one pond within the Project Area. These consisted primarily of palustrine emergent and palustrine forested wetlands, ephemeral drainages, intermittent streams, and upper perennial streams. Of the 22 streams, only 14 appear to possess a relatively permanent flow of water (Copperhead 2025). The 100-year floodplain (as designated by the Federal Emergency Management Agency (FEMA)) traverses the southern border of the Project Area, but does not fall within the boundary.

Although the character of the analysis area (and outside) is considered rural, there are several existing manmade features that are a part of daily life. The presence of the Project would not

further detract from this rural or natural character and would be consistent with the existing character within the vicinity of the Project.

ANALYSIS INPUTS

The viewshed analysis was performed using Esri ArcGIS Pro version 3.5 with the Spatial Analyst Extension. The tool used is called Visibility. The data inputs and parameters used in this tool included the proposed Project infrastructure, such as the arrays, substations, and fence, a digital elevation model (DEM), receptor locations, and a representative vegetation layer.

The vegetative layer was developed using a combination of the USGS National Land Cover Database (NLCD), aerial imagery, and light detection and ranging (LiDAR) point cloud data. LiDAR data is the best available elevation data for this analysis, as it includes high-resolution ground elevations in addition to building and individual tree heights that represent realistic physical visual impediments in the landscape. LiDAR elevation data was used for the topography-only analysis as well.

The LiDAR data provided two important variables for the analysis:

1. Helped confirm locations of vegetation, including filling gaps where the 30-meter resolution NLCD was too coarse to accurately capture existing vegetation in the Project Area. Areas of trees that are approximately 50 to 60 feet wide were included in the vegetation layer, as that was determined to provide adequate screening potential.
2. Identified a range of vegetation heights to be used for the analysis. The highest and lowest return elevation values pertaining to a variety of locations were gathered to estimate overall canopy height. The majority of calculated tree heights ranged from 50-75 feet in the areas sampled. A conservative estimation of tree height to be used in the tool for the areas where trees would not be removed was approximately 60 feet.

Receptors (residences, churches, commercial properties, etc.) were identified using the 911 Site Structure Address Points for the Commonwealth of Kentucky, which are geographic location data used by 911 dispatchers and emergency services. Altogether, 46 receptors were identified and used in the analysis area. A common receptor height of 5.5 feet was used.

Elevation data collected from KyFromAbove in 2022 and 2023 was stitched together to create a single DEM for the analysis area, which served as a base elevation for vegetation and receptors. The approximate height of these inputs was added to the DEM to yield a total height for the analysis.

The Project infrastructure footprint was represented by gridded point locations with an average spacing of approximately 125 feet. Since the arrays would be fixed (i.e., they would not rotate based on the position of the sun), it was determined that this interval would adequately represent the surface of the arrays that could be visible, as well as other Project infrastructure.

ANALYSIS ASSUMPTIONS

The visibility analysis identifies cells (image pixels) that contain elevation information and computes the differences along the terrain surface between an observer in the landscape and a target (e.g., solar array or other Project features). The model used by the visibility tool analyzes the differences along the terrain surface between an observer and all points within the analysis area. Like any model, several assumptions are used to produce the results:

- The model assumes that the viewer has perfect vision at all distances. Atmospheric conditions, such as haze or inclement weather, cannot be incorporated into the tool parameters. Therefore, a certain amount of reasonable interpretation should be considered because of the limitations of human vision at greater distances. Additionally, an object is naturally smaller and shows much less detail at distances and will have less visual impact. These aspects cannot be conveyed with this analysis.
- Leaf-on conditions of the trees are assumed, and transparency predictions through bare-branched trees or leaf-off conditions cannot be made.
- Thinner stands of trees, single trees, and hedgerows or fencerows are not thought to provide adequate screening. Rows of trees less than approximately 50 to 60 feet wide were not used in the analysis.
- Buildings were not included in the analysis, although any structure between the receptor and the Project would greatly reduce the potential for visibility.
- A receptor height of 5.5 feet above ground was used to assume typical eye level or first-floor level.
- The viewshed analysis depicts areas of visibility over a regional area. The analysis can only predict, geographically on a map, areas where some part of the solar facility arrays might be seen. The analysis does not and cannot determine whether a full-on view or a partial view is seen. Additionally, if the analysis determines that visibility may occur in an area, it may only be a result of glimpsing a portion of an array over the treetop, between a gap in the trees, and not a full-on view. Likewise, there may be understory tree gaps where there may be visibility of the Project.

RESULTS AND DISCUSSION

Visibility is interpreted as being from any location where any portion of the Project may be visible, even if such a view is minimal, partial, or viewed through obstructions. Overall, visibility of the Project is expected generally to be minimal and is not anticipated to result in any adverse impacts on the receptor locations, aesthetic resources, or scenic views. The proposed solar facility is consistent with the existing infrastructure and sights within the vicinity of the Project and would not further detract from the rural character of the area.

Of the 46 receptor locations within the analysis area, one is a church. According to modeled results, visibility of the Project from the church is anticipated to be moderate (approximately

18%). Two of the receptors are participating residences. The remaining receptor locations are non-participating residences. Visibility of the Project ranges from Low to High, with a decreasing number of receptors impacted as visibility increases (Table 1). All participating and non-participating receptor locations are shown in Figure 1, Appendix A.

The greatest percentage of the Project that is anticipated to be seen from any non-participating receptor in the analysis area is 41 percent (Receptor 31) (see Table 2). This level of visibility is likely due to factors such as the topography of the analysis area and several of the assumptions described in the previous section. As visualized by the elevation contour lines shown in Figure 2, Appendix A, many of the receptors south of the Project Area are within the same elevation range (approximately 900-1,020 feet above sea level), with a vegetated ravine in between them. Vegetation would normally decrease the potential visibility; however, the vegetation is overall at a lower elevation (generally around or below 900 feet) in comparison to both the Project Area and the receptors.

The Applicant plans to use a landscape plan, which would be installed along the project fenceline. This vegetation is not included in the analysis and is unlikely to have a dramatic effect on the visibility, but would likely further obscure the Project Area from view. Finally, the model assumes perfect vision from the receptor location. Receptor 31 is approximately 985 feet from the fenceline, which represents the nearest piece of infrastructure as part of the Project. Because of the limitations of human vision at greater distances, as well as other analysis assumptions and caveats, and the implementation of the landscape plan, it is anticipated that the percentage visible produced by the model will be much lower in reality.

Table 1. Number of Non-participating Receptors by Level of Visibility of the Project.

Approx. Percent of the Project Visible	Count of Non-participating Receptors
0 (No Visibility)	25
1 – 14 (Low Visibility)	15
15 – 28 (Moderate Visibility)	2
29 - 42 (High Visibility)	2

Approximately 19 non-participating residential receptors are likely to have some visibility of the Project. Those receptors are shown in Table 2. Visibility at the two participating residential receptors, located at 475 Massingale Road and 1837 KY 1009, is estimated to be 16 and 20 percent, respectively. Because these structures are participating, they are not considered further in the results discussion. Visibility does not imply a full-on view, as discussed in the Analysis Assumptions. The visibility analysis and all receptor locations are shown in Figure 3, Appendix A.

While the majority of non-participating receptors in the analysis area (40 in total) are expected to experience no or low visibility of the Project, approximately 4 non-participating receptors are anticipated to experience moderate or greater visibility. This is likely due to a combination of factors, in addition to the analysis assumptions, as described above. For example, the Project is considered to be visible even if only a portion of it may be seen due to vegetative conditions or other structures that may block some, but not all, of the Project. Distance from the receptor location to the Project was not incorporated into the analysis; however, this factor, in combination with the varying heights of the Project infrastructure, terrain, and vegetation within the analysis area, is an important consideration in interpreting these results.

No schools or public or private parks are found within the analysis area. Two residential neighborhoods [as defined by KRS 278.700(6)] occur within the analysis area. All non-participating receptors within these residential neighborhoods are anticipated to experience a low level of visibility of the Project. In total, 11 receptors are in the residential neighborhoods; however, only three receptors are expected to have any visibility of the Project, which are identified with an asterisk (*) in Table 2.

Table 2. Modeled Visibility Results at Each Non-participating Receptor (where visibility is greater than zero).

Receptor #	Approx. Percentage of the Project Visible at Non-participating Receptors
1	5%
3	0.42%
Fairview Church	18%
4	1%
7	1%
8	2%
10	12%
11	18%
12	0.14%
14	1%
16	2%
20	3%
24	9%

Receptor #	Approx. Percentage of the Project Visible at Non-participating Receptors
26	3%
27	38%
31	41%
32*	0.71%
37*	7%
42*	5%

* Indicates receptors are within residential neighborhoods, as defined by KRS 278.700(6).

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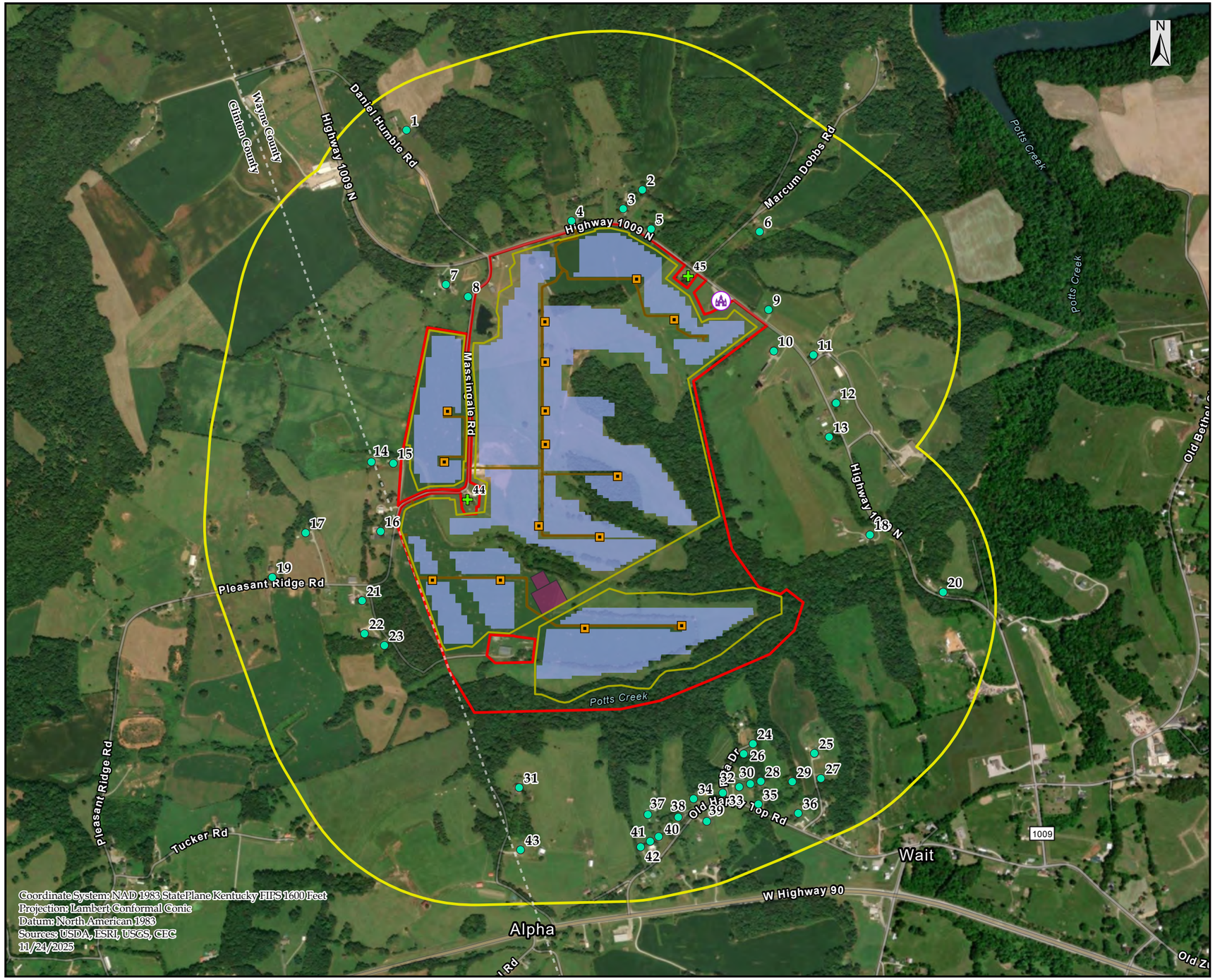
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APPENDIX A

Visibility Analysis Result Maps



COPPERHEAD
ENVIRONMENTAL CONSULTING

Prepared for:

Barrelhead Solar, LLC

FIGURE 1:
Structures and Design Layout for the
Barrelhead Solar Project,
Wayne County, Kentucky.

Legend

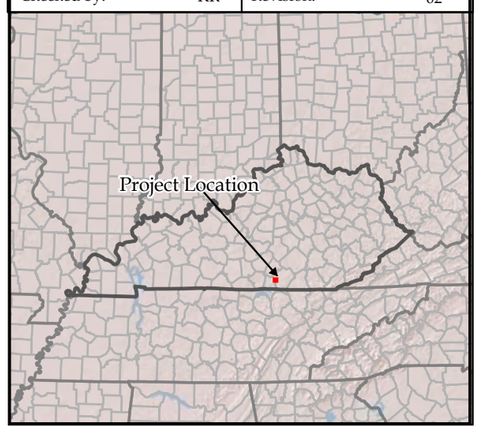
- Participating Residence
- Occupied Structure
- Fairview Church
- Inverter
- Fence
- Road
- Solar Array
- Substation
- 2000ft Buffer
- Project Boundary

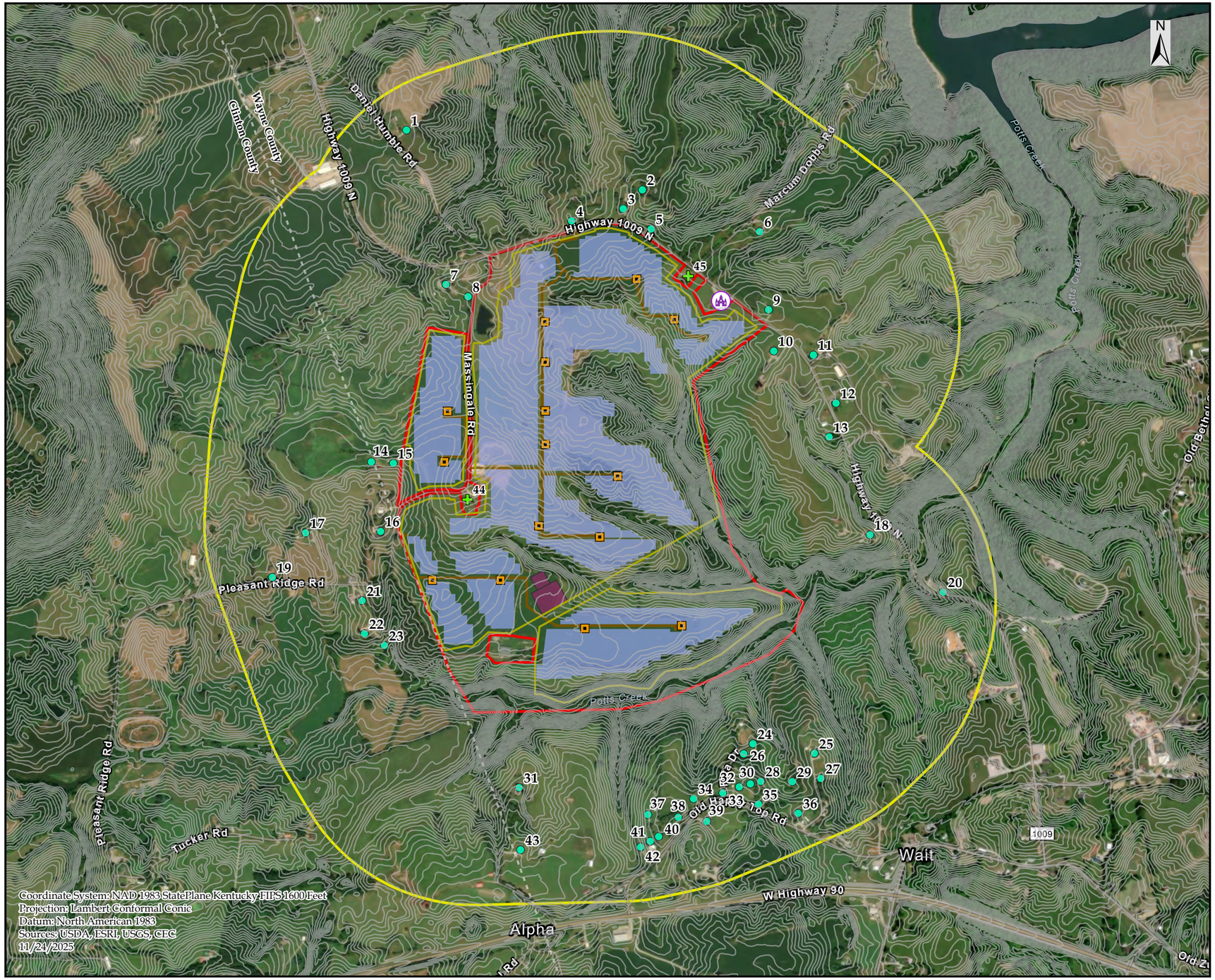
0 750 1,500
US Feet

Scale: 1 in = 1,000 ft

Prepared by :
Copperhead Environmental Consulting, Inc.
471 Main Street
P.O. Box 73
Paint Lick, Kentucky 40461

Drawn by:	TC	Date:	11/24/2025
Checked by:	KR	Revision:	02





COPPERHEAD
ENVIRONMENTAL CONSULTING

Prepared for:

Barrelhead Solar, LLC

FIGURE 2:
Structures and Design Layout for the
Barrelhead Solar Project,
Wayne County, Kentucky.

Legend

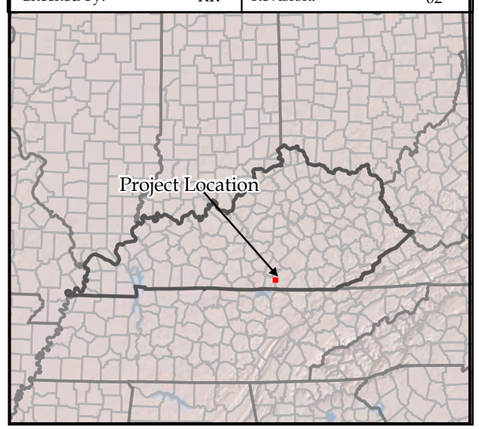
- Participating Residence
- Occupied Structure
- Fairview Church
- Contour Elevation
- Inverter
- Fence
- Road
- Solar Array
- Substation
- 2000ft Buffer
- Project Boundary

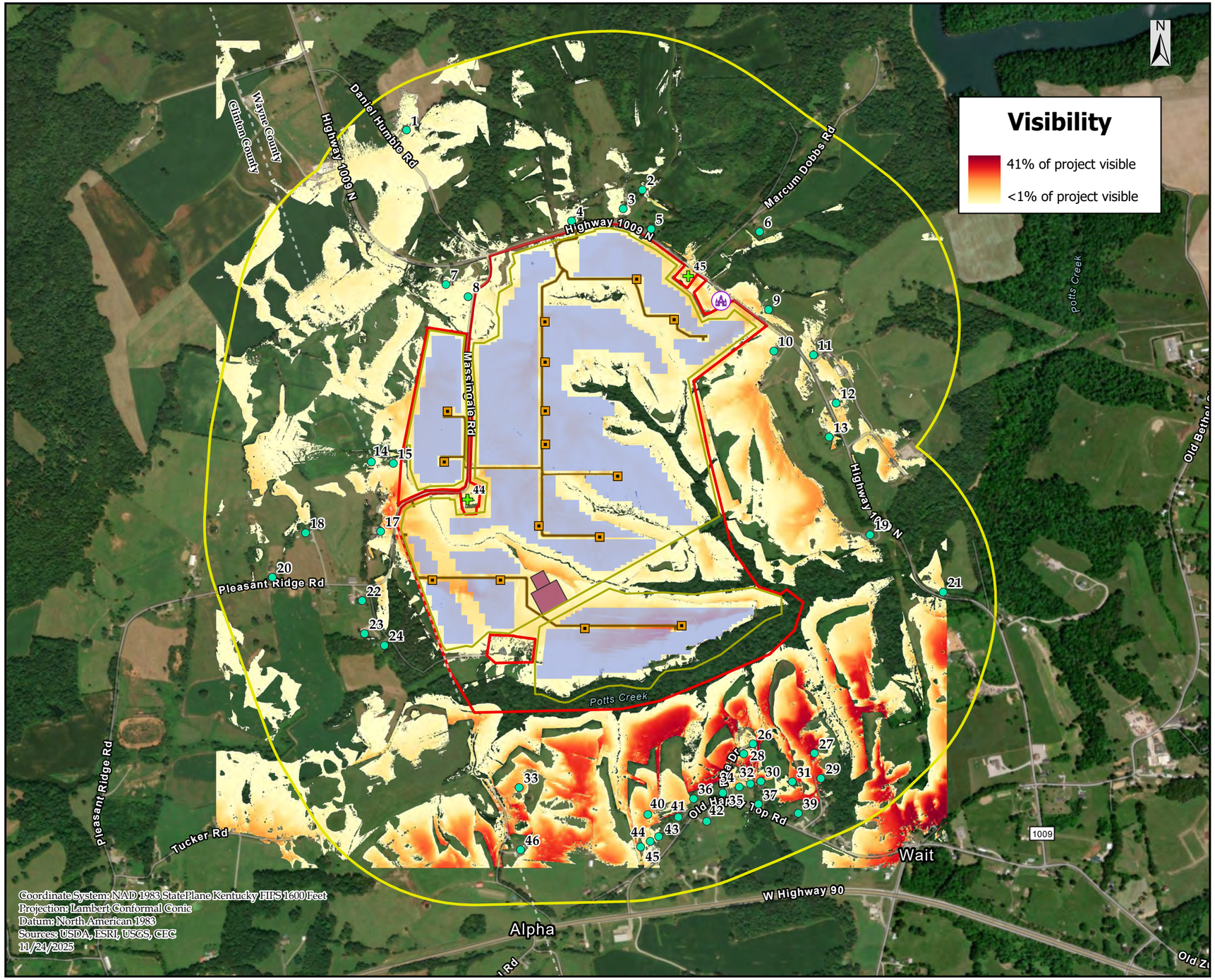
0 750 1,500
US Feet

Scale: 1 in = 1,000 ft

Prepared by :
Copperhead Environmental Consulting, Inc.
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Paint Lick, Kentucky 40461

Drawn by:	TC	Date:	11/24/2025
Checked by:	KR	Revision:	02





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ENVIRONMENTAL CONSULTING

Prepared for:

Barrelhead Solar, LLC

FIGURE 3:
Structures and Design Layout with Visibility Overlay for the Barrelhead Solar Project, Wayne County, Kentucky.

Legend

- Participating Residence
- Occupied Structure
- Fairview Church
- Inverter
- Fence
- Road
- Solar Array
- Substation
- 2000ft Buffer
- Project Boundary

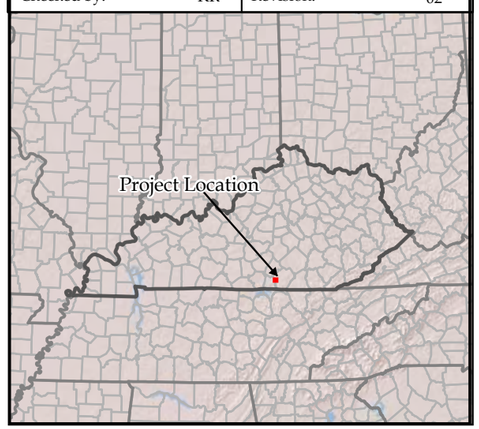
0 750 1,500
US Feet

Scale: 1 in = 1,000 ft

Prepared by :

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Paint Lick, Kentucky 40461

Drawn by:	TC	Date:	11/24/2025
Checked by:	KR	Revision:	02



Siting Board 1-60:

Refer to the SAR, Appendix G, Visual Impact Report, Table 2. Explain whether planting screening vegetation within the property boundaries of Receptors 27 and 31 would reduce visibility of the Project at those locations.

Response: Based on modeled results, Receptors 27 and 31 may have a view of approximately 38 percent and 41 percent of the Project, respectively. Planting vegetative screening within the property boundaries of these Receptors could reduce the visibility of the Project but is not expected to achieve full screening. These receptors are at a higher elevation than much of the Project Area, which is likely contributing to the modeled results. Because spatial models rely on a set of assumptions, it is unlikely that the viewer at these locations would always have a perfect and/or straight-on view of the Project. Other aspects that would reduce visibility cannot be conveyed in the analysis, such as atmospheric conditions, the limitations of human vision, and linear perspective/visual angle, which makes an object appear even smaller with distance.

Witness: Marty Marchaterre

Siting Board 1-61

Refer to the SAR, Appendix G, Visual Impact Report, Table 2. State whether the Applicant would be willing to plant vegetative screening directly on the properties of Receptors 27 and 31, if requested or desired by those landowners.

Response: Barrelhead Solar is open to discussing landowners' concerns and will coordinate with them to mitigate any issues that may arise.

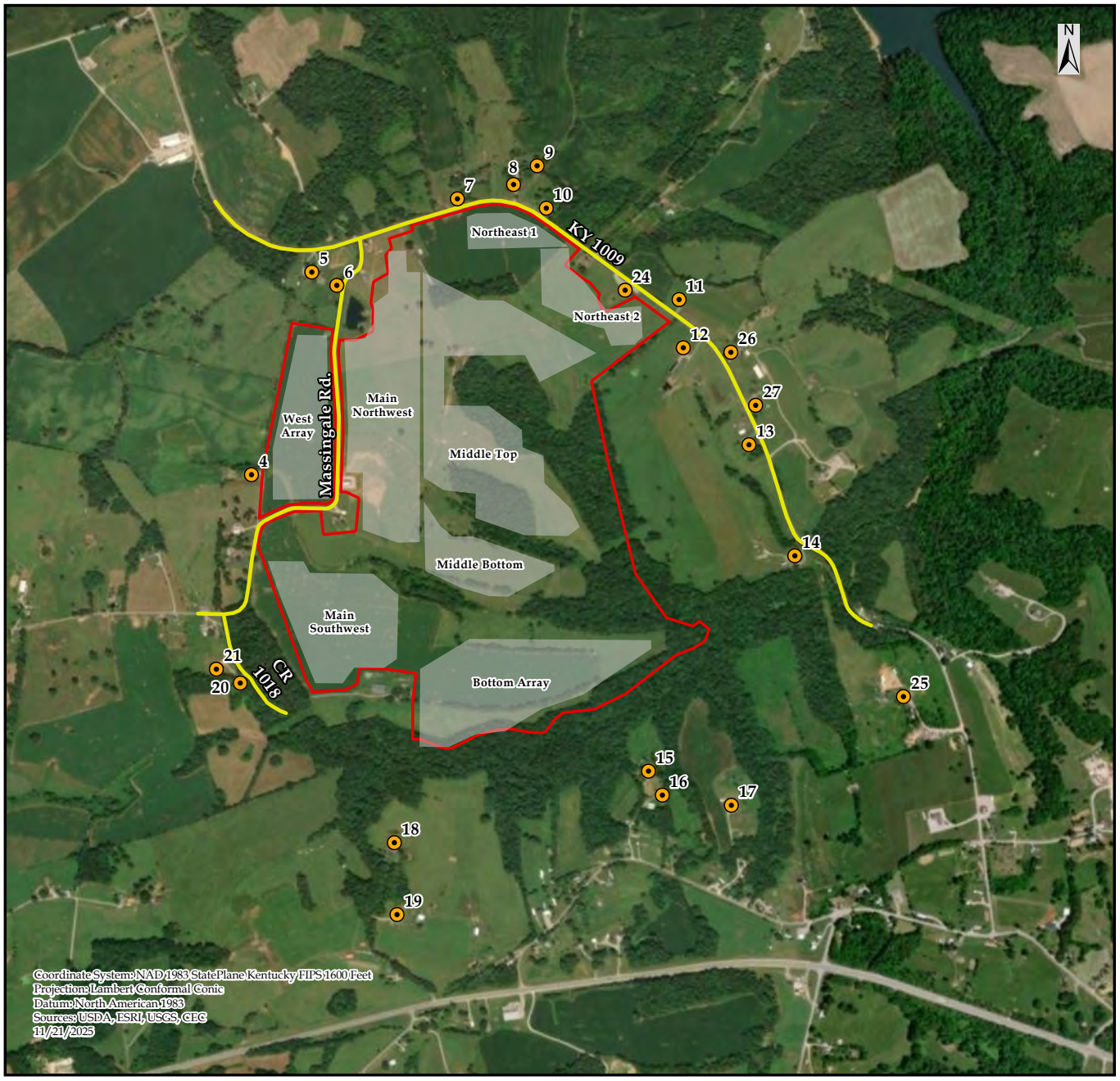
Witness: Marty Marchaterre

Siting Board 1-62:

Refer to the SAR, Appendix H, Glare Analysis. Provide a map identifying and labeling the locations of the three road segments and 22 observation points evaluated in the Glare Analysis.

Response: A map identifying and labeling the road segments and observation points used as inputs in the Glare Analysis is provided as Attachment 1-62.

Witness: Marty Marchaterre



COPPERHEAD
ENVIRONMENTAL CONSULTING

Prepared for:

Barrelhead Solar, LLC

FIGURE 1-62:
Glare Analysis Components
for the Barrelhead Solar Project,
Wayne County, Kentucky.

Legend

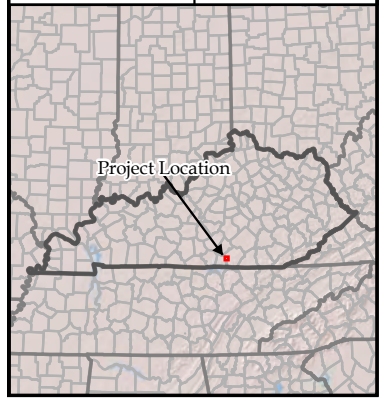
- Observation Point
- Road Segment
- Panel Area
- Project Boundary

0 1,250 2,500
US Feet

Scale: 1 in = 1,250 ft

Prepared by :
Copperhead Environmental Consulting, Inc.
471 Main Street
P.O. Box 73
Paint Lick, Kentucky 40461

Drawn by:	TC	Date:	11/21/2025
Checked by:	KR	Revision:	01



Siting Board 1-63:

Refer to the SAR, Appendix H, Glare Analysis. Tables 2 through 4 indicate glare from specific "panel areas". Provide a map identifying and labeling these different panel areas throughout the Project site.

Response: The panels areas are shown on the map provided as Attachment 1-62. Note that these areas are generalized from the preliminary design plan because of limitations within the ForgeSolar analysis tool. Limitations include the number of vertices permitted (up to 80 vertices) to create each polygon feature, the total polygons permitted in the analysis, and the shapes that are analyzed. Although care is taken to draw sections of adjacent arrays as accurately as possible within the limitations of the tool, the tool may automatically adjust concave polygons into convex polygons, which further generalizes the analysis. Despite this, it has often been beneficial to use different array areas to troubleshoot and further refine the project design and reduce adverse effects from glare as much as possible.

Witness: Marty Marchaterre

Siting Board 1-64:

Refer to the SAR, Appendix G, Visual Impact Report at 2, which states that the arrays would be fixed (not rotate with the position of the sun). Explain whether tracking arrays would reduce the potential for glare described in the Glare Analysis.

Response: The current application has proposed a fixed tilt system; however, Barrelhead Solar will evaluate the glare impact of a tracking system if a tracking system is utilized. Barrelhead Solar will prepare and submit additional glare analysis information once it is completed.

Witness: Marty Marchaterre

Siting Board 1-65:

State any concerns or comments provided by representatives of Fairview Church or the Pleasant Ridge Amish Mennonite Church.

Response: To date, no concerns or comments have been received from representatives of Fairview Church or Pleasant Ridge Amish Mennonite Church.

Witness: Trudie Grattan

Siting Board 1-66:

Provide any available transcripts of the public meetings. Provide any written or oral comments offered by the public or government agencies, from public meetings or through other avenues.

Response: No transcripts from public meetings are available. A summary of public involvement, including any comments offered by the public or government agencies, was provided in Section 6 of the Application.

Witness: Trudie Grattan

Siting Board 1-67:

Refer to the SAR, Section 6 Mitigation Measures, Item 32. Provide details describing the Complaint Resolution Program, including how the Applicant will coordinate with local landowners or others in case of complaints or other issues that might arise during the course of construction or operations. If no details are available, provide a copy of a Complaint Resolution Program the Applicant has instituted for a similar solar project.

Response: The Complaint Resolution Plan developed for the Project is provided as Attachment 1-67. As described in the Plan, the Applicant will regularly check the phone number, email address, and online contact forms to determine whether any complaints have been received and will reach out to the complainant within 72 hours to obtain any additional information needed about the complaint. After receiving the necessary information, Barrelhead Solar will investigate the complaint, document the details, and determine whether any federal, state, or local laws or permits have been violated. After these steps, Barrelhead Solar will determine how best to address the complaint and the conditions causing the complaint and work in good faith to resolve reasonable requests as soon as practicable.

Witness: Marty Marchaterre

Barrelhead Solar

Complaint Resolution Plan

Barrelhead Solar, LLC



Table of Contents

Barrelhead Solar Complaint Resolution Plan—Introduction 1
Purpose of Complaint Resolution Plan 1
Complaint Filing Process 1
Complaint Review Process 2
Complaint Identification: 2
Complaint Investigation: 2
Response: 2
Documentation: 2
Public Notification of Complaint Process: 3
Barrelhead Solar Complaint Log Sheet 4

Barrelhead Solar Complaint Resolution Plan—Introduction

Barrelhead Solar, LLC (Barrelhead Solar) is proposing to construct and operate an approximately 54 megawatt (MW) solar energy facility, the Barrelhead Solar Project (Project). It is located on KY 1009 and Massingale Road, southwest of the city of Monticello in Wayne County, Kentucky. The Project, which will be located on leased private land, will include a commercial-scale solar power project and the associated solar photovoltaic panels, racking systems, electric equipment, a project substation and transformer, and underground electrical connection lines.

Barrelhead Solar endeavors to ensure the Project is constructed and operated in a responsible manner to minimize the Project's impact on nearby residents or those passing through the area.

Barrelhead Solar will construct and operate the Project in accordance with all applicable federal, state, and local laws and permits. However, to address concerns of residents that might occur during construction, operation, or decommissioning, a Complaint Resolution Plan (Plan) has been established. The Plan defines a process for receiving, investigating, and addressing complaints.

Purpose of Complaint Resolution Plan

The purpose of this Complaint Resolution Plan is to establish a process and procedures for the public to notify Barrelhead Solar if concerns arise during the construction, operation, or decommissioning of the proposed Project. This Plan includes commitments for addressing public complaints. It includes procedures for dispute resolution during Project activities.

The Complaint Resolution Plan includes steps for informing the public about the complaint process, the process for registering a complaint, protocols for gathering and analyzing information regarding complaints, and procedures that may be unique for certain types of complaints (e.g., noise) or for different stages of the Project (e.g., construction and operation). The Plan also describes actions Barrelhead Solar would take if a complaint were to remain unresolved after all these steps are followed.

Complaint Filing Process

Individuals wishing to file a complaint can do so by one of the following means:

- Phone: _____
- Email: _____(Preferred)
- Online Contact Form: _____

When filing a complaint, please provide the following information to ensure Barrelhead Solar can accurately and thoroughly address the complaint:

- Name and contact information of the complainant
- Date of complaint
- Detailed description of the complaint, including, if possible, the location, date(s), and time that the situation occurred, photographs, and any other details that can help identify and resolve the situation.

Complaint Review Process

Complaint Identification: Barrelhead Solar will regularly check the phone number, email address, and online contact forms to determine whether any complaints have been received. In the event that Barrelhead Solar receives a complaint, a representative of Barrelhead Solar will reach out to the complainant within 72 hours to obtain additional information about the complaint.

Complaint Investigation: After receiving the necessary information regarding a complaint, Barrelhead Solar will investigate the complaint to determine whether the complaint has merit. Investigations will identify and characterize the nature of the complaint (e.g., traffic, dust, noise, etc.) and to the extent possible, the source (e.g., construction vehicles and equipment, environmental conditions, etc.).

Barrelhead Solar will enter a complaint into a complaint log, document the details of the complaint, and assign a point of contact to investigate the complaint. The Site Project Manager will be responsible for initiating the review of complaints received during the construction process. The Site Project Manager and/or Operation and Maintenance (O&M) staff will be responsible for initiating the review of complaints reported during the operational and decommissioning phases.

Barrelhead Solar will first determine whether complaints violate federal, state, or local laws or permit conditions, and whether there are notifications or required steps to address those violations. Barrelhead Solar will also determine whether outside resources are necessary to address situations.

Response: After enough information has been obtained to fully understand the nature of the complaint, Barrelhead Solar will work with appropriate personnel and/or parties to determine how to best address the complaint and the conditions that are causing the complaint. If the complainant or other parties seek additional information related to the complaint, Barrelhead Solar will work with those parties to obtain the necessary information to move forward.

Barrelhead Solar will work in good faith to address and/or resolve reasonable complaints as soon as practicable. Barrelhead Solar is committed to resolving reasonable complaints within 30 days unless extenuating circumstances necessitate a longer time period or it is determined that the complaint is unresolvable. Barrelhead Solar will provide an explanation for the complainant concerning the extended period and the timeline for addressing the complaint should complaint resolution take longer than 30 days. Safety and good community relations are among the highest priorities to Barrelhead Solar; as such, speedy resolution of legitimate complaints is essential.

Documentation: Barrelhead Solar will keep records of complaints received. The complaint log will include, if available, the date of the complaint, the name of the complainant, contact information for the complainant (including address and phone number), and a detailed description of the complaint. The complaint log will also include a description of the subsequent actions taken to resolve each complaint and complaint resolution if resolution is feasible. Barrelhead Solar will maintain the complaint log. This log will be available to Wayne County Fiscal Court for inspection upon request (see Complaint Log Sheet at the end of this Plan).

In the event that Kentucky state agencies, Wayne County Fiscal Court, or County Departments receive complaints directly about unanticipated effects of Project construction or operation, the respective

State or County representatives will notify Barrelhead Solar as soon as practicable and provide details of such a complaint in writing. Wayne County and Barrelhead Solar will designate appropriate officials for such communications. Barrelhead Solar will then investigate the complaint as outlined above.

Public Notification of Complaint Process: At least (2) weeks prior to the commencement of construction, Barrelhead Solar will publish a summary of the Complaint Resolution Plan on the Project's website, and the Plan will be available at the temporary construction office.

Barrelhead Solar Complaint Log Sheet

Compliant Log Sheet

Project Personnel Receiving the Complaint:
Method of Receiving Complaint (circle one): Phone Email Mail Other (describe)
Date Complaint Received (MM/DD/YY):
Time Complaint Received:

Compliant Information

Name of Complainant:
Address of Complainant: Phone Number of Complainant: Date/Time of Bothersome Activity: Construction or Operation Complaint? (circle one) Nature of Complaint (describe in detail):

Resolution and Follow-up

Definition of problem after investigation by Project personnel:
Description of corrective measures taken: Date corrective measure(s) completed: Date first letter sent to complainant: (copy attached) Date second letter sent to complainant: (copy attached) Follow-up actions if correctives measure(s) unsuccessful or unavailable:

This information is certified to be correct: _____
(Attach additional pages and supporting documentation, as required.)

Siting Board 1-68:

Explain whether a Project website will be established. If so, explain when this will occur. If not, explain the Applicant's plan for providing on-going Project information to the public.

Response: Barrelhead Solar plans to establish a Project website, which is anticipated to be available to the public in the first quarter of 2026.

Witness: Trudie Grattan

Siting Board 1-69:

Refer to the Application, Attachment F, Economic Analysis, at 9 and 14. Explain what costs are included in the estimated $35 million in construction compared to the stated roughly $80 million in capital expenditures.

Response: It is not unusual to have construction costs around 44% of total capital expenditures. Construction costs include site preparation, rack and mounting systems, electrical equipment, and all associated and required labor. Solar modules will be a large share of capital expenditures, but they are not considered construction costs. Other capital expenditure items will include additional equipment costs and other miscellaneous items.

Witness: Joshua Pinkston

Siting Board 1-70:

Refer to the Application, Attachment F, Economic Analysis at 9-10. The estimate of 129.6 FTE jobs is based on data obtained from a 2014 California study. Explain whether any more recent studies, or studies focusing on projects located closer to Kentucky are available and applicable to this Project.

Response: The 2014 UC Berkeley study used to produce the estimate of 129.6 FTE jobs remains a national benchmark because it is the only study that used detailed, project-level labor data (including actual payroll information) from multiple utility-scale solar installations. There are more recent analyses by the National Renewable Energy Laboratory (2023) and the U.S. Department of Energy (2021) that produce similar estimates; however, they are not based on the same quality of data. Other recent filings for utility-scale solar projects in Kentucky and neighboring states also show similar labor intensities (between 2.0 and 3.0 FTE jobs per MW). Therefore, the 2.4 FTE-per-MW coefficient used in this report is still consistent with more up-to-date evidence and, if anything, it seems to yield somewhat conservative estimates.

A revised Economic Impact Analysis report that includes this information is provided as Attachment 1-70.

Witness: Joshua Pinkston

Joshua C Pinkston, Ph.D.
Consulting Economist
13115 Harpy Eagle Ct. Louisville KY 40245 502 409-3765 pinkston.josh@gmail.com
Associate Professor of Economics, University of Louisville

November 24, 2025

TO: Marty Marchaterre
Senior Environmental Planner
Copperhead Environmental Consulting, Inc.
Lexington, Kentucky
mMarchaterre@copperheadconsulting.com

FROM: Joshua Pinkston

RE: Updated Economic and fiscal impact of Barrelhead Solar, LLC

Copperhead Environmental Consulting needs an economic impact statement for a proposed solar energy project in Wayne County, Kentucky, as part of its application to the Kentucky Public Service Commission's Siting Board. Barrelhead Solar, LLC, will build on 307 acres of leased private land, and have a nominal capacity of approximately 54 MW. The developer is expected to invest nearly $81 million in the project. This report provides estimates of the new local economic and fiscal activity expected from the project.

There will be two primary impacts from the project. First, there will be an increase in construction and related jobs as the project is built over approximately one year. Combining the developer's estimated construction cost of nearly $35 million and estimates of construction payroll required by the project, I estimate that there will be a total of roughly 184 new jobs in the county that year, with new labor income of over $13 million.

The ongoing annual economic impacts of the solar farm's operation include the positive effects of operational and maintenance jobs, plus the effects of the new lease payments to the owners of the land. In Appendix 2, I compare these positive effects to the effects of lost agricultural activity and find that Wayne County will gain several new jobs from the operational phase of the project with a combined increase in labor income of over $830,000 per year. Over a horizon of 40 years and including the impacts of construction, I estimate a net increase of roughly 466 job-years and over $46 million in new labor income.

Tax revenue for the county will also increase because of the project. I estimate that the new labor income will translate to $309,167 in occupation tax revenue over 40 years, with nearly $75,000 coming from construction in the first year. The exact increase in property tax revenue will depend on a potential Industrial Revenue Bond and Payment in Lieu of Taxes agreement; however, the projections I was provided suggest the county can expect at least another $1.6 million in revenue over the life of the project.

Location and Regional Economy

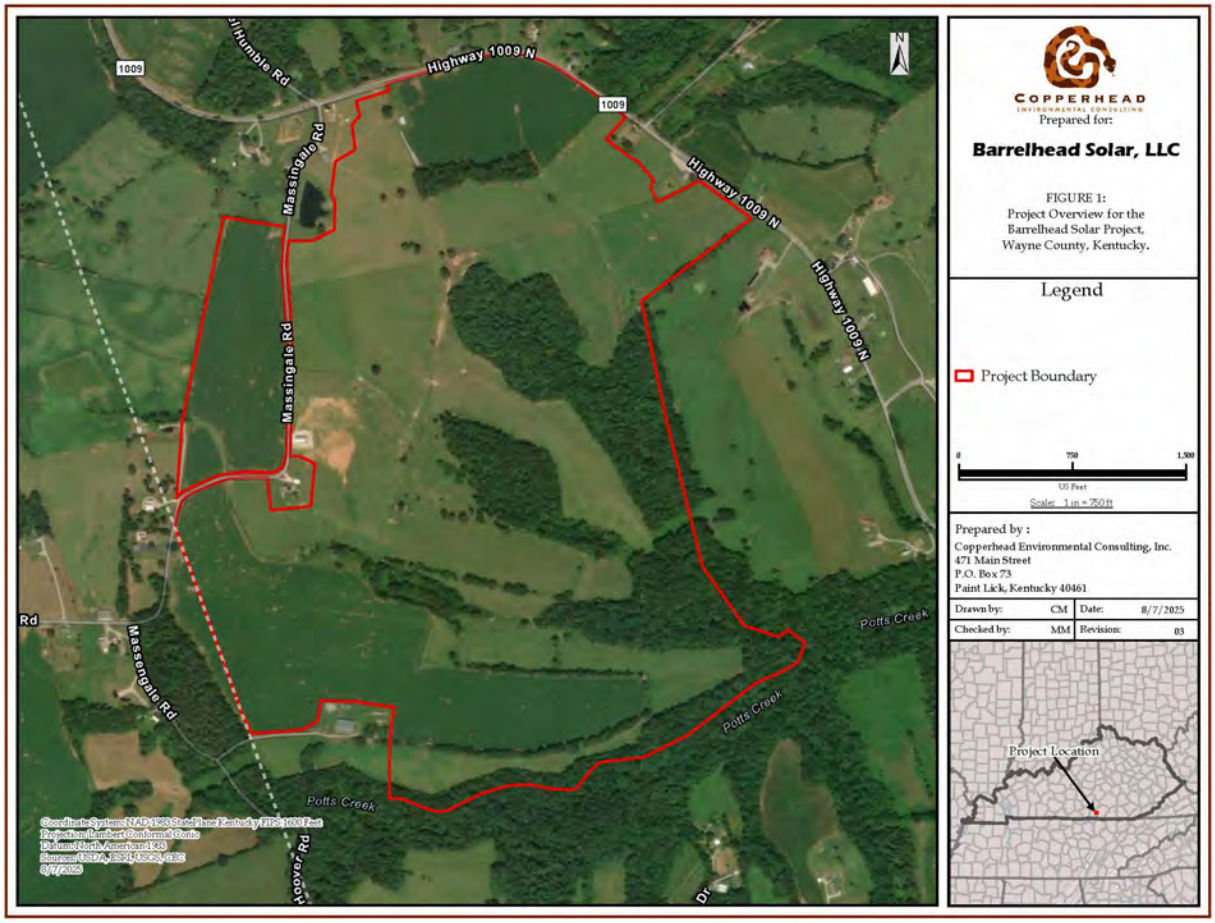
The project site is in southern Kentucky near the Tennessee state line in western Wayne County. The site is southwest of Monticello, just off State Highway 90. The approximate location is indicated by the red star in Figure 1.

Figure 1



Figure 2 is a site map provided by Copperhead Environmental Consulting. The project, which borders Clinton County, will be inside the boundaries indicated by red lines. The aerial image shows a mix of agricultural lands with some woods. The developer estimates that the land is currently 45.7% grassland/pasture, 24.2% forested, 24.4% cropland (corn and soybeans), and 5.7 % other uses. Counting both pasture and cropland, roughly 215 acres of potential agricultural activity is expected to be displaced.

Figure 2



The U.S. Census Bureau's American Community Survey (ACS) provides a summary of Wayne County's demographic and economic characteristics. Appendix 1 provides more detail, as well as a comparison to the State of Kentucky, using the most recent (2023) release of the ACS. Wayne County stands out from the state in several dimensions:

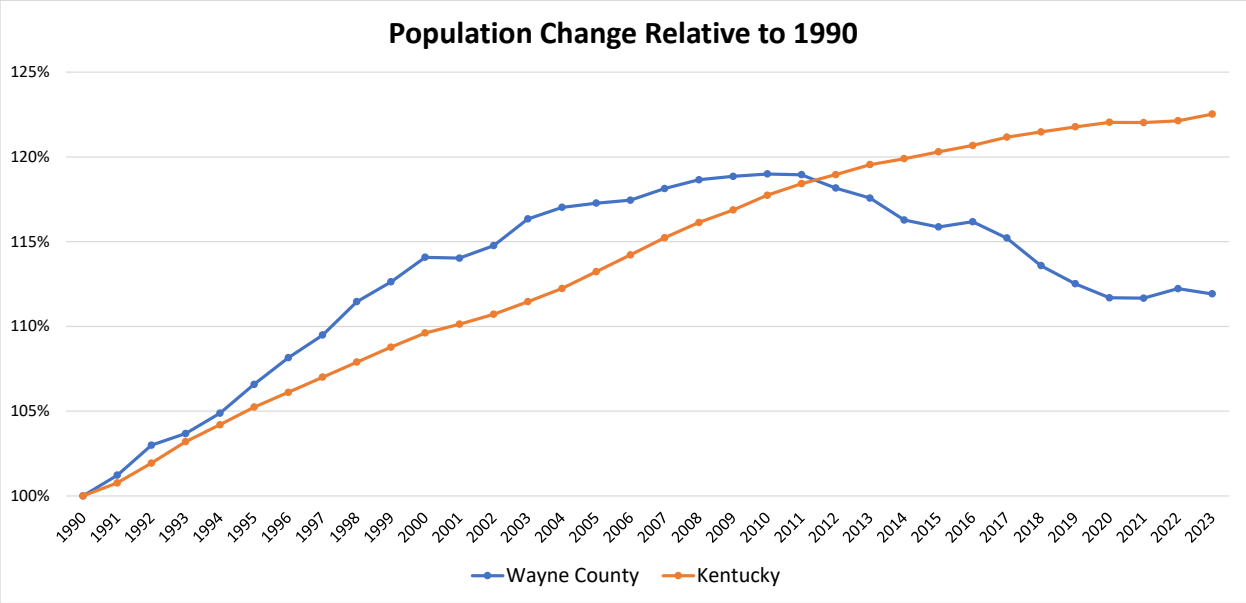
- Wayne County ranks 97th out of 120 Kentucky counties in median household income, putting it in the poorest 20% of counties. Median household income is only $41,933 in the county, compared with $62,417 in the state. Furthermore, 24.3% of Wayne County residents live in poverty, compared to 16.1% of the state.
- While nearly 60% of Kentucky's population over the age of 16 is in the labor force, only 47% of Wayne County's is. As a result, only 44.7% of the population of Wayne County is employed, compared to 56.4%.
- Educational attainment is notably lower in Wayne County than in the state. 79.4% of Wayne County residents over the age of 25 graduated from high school, compared

to 88.5% statewide; and the percentage of county residents with a bachelor's degree or higher is roughly half of the state percentage.

- The median age of the population is over four years older than the median age of the state, and a higher percentage (21.2% vs 17%) is over the age of 65. Over a quarter of noninstitutionalized Wayne County residents have a disability compared to under 18% of state residents, which may be due in part to the age differences.

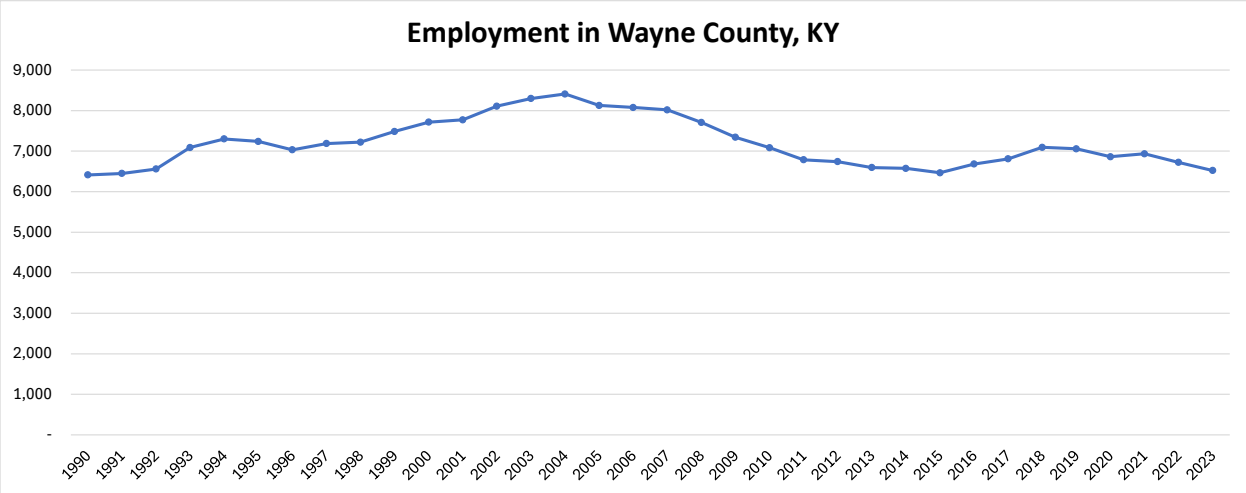
Wayne County's population was estimated to be 19,580 in 2023. As shown in Figure 3, the county's population increased between 1990 and 2010, growing more quickly than the state through much of the 1990s. Wayne County's population peaked at 20,827 in 2010, but it then declined between 2010 and 2020. In contrast, Kentucky's population growth has been relatively steady since 1990.

Figure 3



Wayne County's decline in population since 2010 followed a decline in employment (Figure 4) that began in 2003. Fortunately, that employment decline leveled off and even reversed slightly after 2015.

Figure 4



Wayne County has long been more reliant on transfer payments—including Social Security, Medicare, Medicaid—than Kentucky as a whole (Figure 5), as one would expect given the economic and demographic differences noted above. While the reliance on transfer payments as a share of income has increased since 1990 for both the county and the state, the gap between Wayne County and Kentucky began increasing in the early 2000s, shortly after employment started falling in the county. As of 2023, transfer payments accounted for 48% of personal income in Wayne County, compared to 26% of personal income in Kentucky.

Figure 5

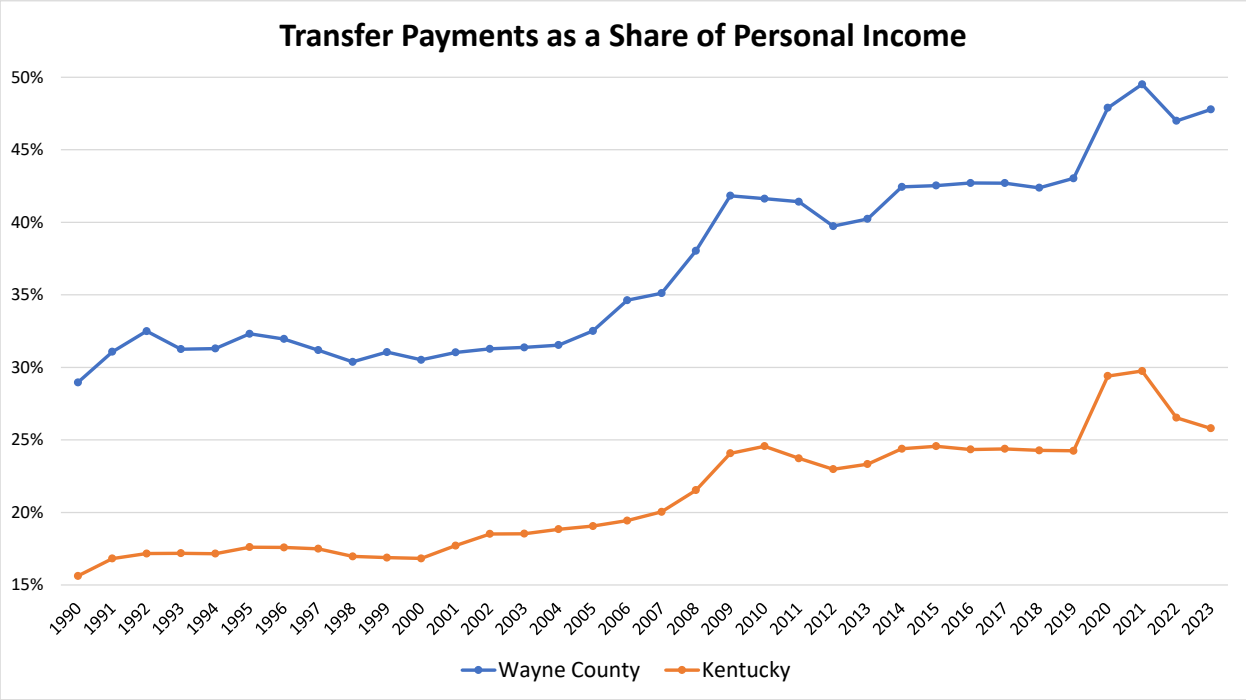
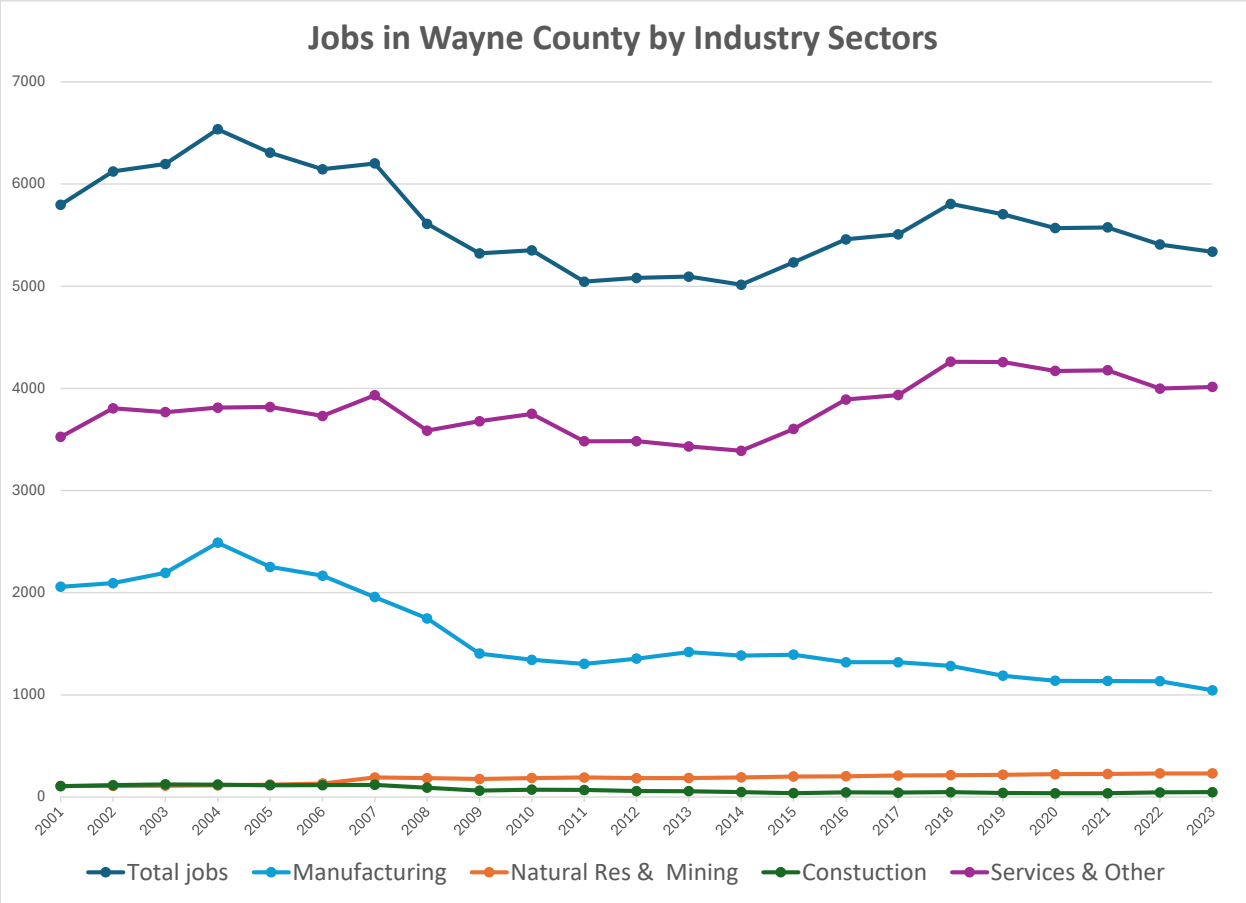


Figure 6 shows the number of jobs in Wayne County broken into broad industry categories from 2001 to 2023[1]. We can see that the early 2000's decrease in employment noted above can be largely accounted for by a decline in manufacturing jobs in Wayne County. It's also worth noting that the construction sector, which will be more affected by this projected than any other sector, currently accounts for fewer than 1% of jobs in Wayne County.

[1] These data come from the Quarterly Census of Employment and Wages (QCEW). See https://www.bls.gov/cew/data.htm for more information. Note that the QCEW counts number of jobs at establishments in Wayne County. The employment numbers in Figure 4 are estimated numbers of employed Wayne County residents, some of whom may have more than one job.

Figure 6



Finally, it's important to acknowledge that some workers employed in Wayne County live in other counties, and some Wayne County residents are employed in other counties. Table 1 shows that fewer than 80% of workers in Wayne County live in the county, with residents of Clinton and Pulaski accounting for most of the rest (7.4% and 6.6% respectively). Looking at where Wayne County residents work (Table 2), we see that commuting out of the county is more common than commuting into it. Most residents who commute out of the county and 16.3% of all employed residents commute to Pulaski County, which is Wayne County's largest neighbor measured by either employment or GDP.

Table 1		
County of Residence for Workers Employed in Wayne County		
Wayne County, KY	5,054	79.4%
Clinton County, KY	468	7.4%
Pulaski County, KY	423	6.6%
McCreary County, KY	170	2.7%
Cumberland County, KY	86	1.4%
Pickett County, TN	61	1.0%
Owen County, KY	37	0.6%
All Other	64	1.0%
Total	6,363	100.0%
Source: US Census Bureau, American Community Survey, Residence County to Workplace County Commuting Flows, 5-Year ACS, 2016-2020		

Table 2		
County of Employment for Residents of Wayne County		
Wayne County, KY	5,054	69.1%
Pulaski County, KY	1,193	16.3%
Clinton County, KY	637	8.7%
Shelby County, TN	146	2.0%
Russell County, KY	115	1.6%
All Other	166	2.3%
Total	7,311	100.0%
Community Survey, Residence County to Workplace County Commuting Flows, 5-Year ACS, 2016-2020		

Modelling the Economic Impacts

I model the regional economic impacts of the Barrelhead Solar project using a customized input-output model of Wayne County constructed in IMPLAN[2]. I have purchased annual economic data for all 120 Kentucky counties and use these as needed to construct regional models of counties, groups of counties, or the state. The model has detailed information about the linkages among over 500 potential industries in each regional economy, as well as the relationship between household spending and demand for local goods and services spurred by increases in employee compensation or other income.

When there is new industrial activity in a region, there will obviously be a *direct effect* of expenditures, including wages, on the local economy. The strength of the model is that it can also predict how much of the supply chain is likely to be met by local businesses and how much the new wages will lead to additional sales (and hiring) by local businesses. The effects due to local businesses being part of the supply chain are known as *indirect effects*, while the increase in local consumer spending due to increased labor income is an *induced effect*.

The ratio of the change in total regional economic activity to a direct change in activity by a regional industry is called a multiplier. For example, if a new manufacturing company adds 100 jobs and the County were to ultimately see another 80 jobs due to the combination of indirect and induced effects, the employment multiplier would be 1.8 (180 total jobs

[2] For documentation of IMPLAN modeling, see www.implan.com/history/ .

divided by 100 direct jobs). Similar multiplier effects are generated for business output, employee compensation, and value-added[3].

A solar project has two phases, construction and operations. The construction phase is expected to last about one year, while the operations phase will last decades. Almost all the employment will occur in the construction phase. The regional economic impacts will consist of the direct effects of spending by the developer, as well as spinoff impacts due to local purchases of supplies and new spending by households due to increased income.

The relevant sector in IMPLAN for the construction phase is number 47, "Construction of new power and communication structures", which is used to model the initial investment. The employment multiplier for this sector in Wayne County model is 1.183 in the latest IMPLAN release (2023 data). This is a small multiplier because almost all the materials used to assemble a solar farm are made outside the county, which means that few of the indirect effects of this project will be captured by local industry.

There will also be some economic impact of ongoing operations. Unfortunately, the relevant industry for the operations phase, number 37, "Electric Power Generation – Solar", is empty of data for Wayne County and the Kentucky counties it borders because these counties lack a history of solar electricity generation. As an alternative, I will model the impact on Wayne County using data from two other counties in southern Kentucky: Whitley County to the east and Metcalfe County to the west[4]. In any case, the ongoing annual economic impacts are likely to be small relative to the one-time impacts of construction.

Local Economic Impacts of the Construction Phase

The developer estimates total construction costs of $34,969,731. Construction will be contracted out, so it's not possible to know exactly how many workers will be employed or their total compensation. Instead, I'll model the impact using the results of a study from UC-Berkeley that examined five large solar projects in California, finding an average of 2.4 full-time-equivalent (FTE) construction jobs were hired per MW built. Multiplying that by the 54 MW of the Barrelhead Solar project, gives an estimated 129.6 FTE jobs in the year of

[3] Value-added is a measure of how much economic activity "sticks" to a region. For example, if one purchases a new vehicle for $40,000 from a local dealership, only a few thousand dollars is captured in the county. Business revenues rise by $40,000, but most of it flows out to the place where the vehicle was made. Local value-added measures the fraction of the sale that ends up paying workers and owners at the dealership, as well as any local taxes captured from the sale.

[4] These are the closest two counties I could find for which IMPLAN provides data for industry 37 in 2023, with the halfway point between Metcalfe and Whiley Counties falling inside of Wayne County. Averaging the employment multipliers for this industry in these counties yields an estimated multiplier of 1.97.

construction[5]. IMPLAN uses counts of jobs as job-years, not FTE jobs; so, I use an industry-specific crosswalk they provide to convert FTE to total jobs. Because most construction jobs are full-time this results in a small change of 129.6 FTE jobs to 133.4 total job-years.

I estimate average employee compensation for the construction phase using a weighted average of IMPLAN's estimates for Wayne County and its four neighboring Kentucky counties. This should mitigate any concern that estimated compensation in a single county is unreliable due to the small size of the local industry. The result is an estimated total compensation (including fringe benefits) of $59,339.37 per employee. Multiplying that by the estimated number of jobs yields approximately $7.9 million in employee compensation for the construction phase.

Estimated proprietor income in IMPLAN can be even more volatile in small counties than employee compensation. IMPLAN's estimated proprietor income for Wayne County is far larger than for any surrounding counties, and it's even larger than estimated employee compensation. This is likely an anomaly related to the small size of the county, but it inflates estimated labor income[6]. As a much more conservative alternative, I use the estimated proprietor income from Pulaski County, Wayne County's largest neighbor, which is just approximately $3 million.[7]

Table 3 presents the direct economic effects of the construction phase, the spin-off effects that are expected, and the total economic impact. As discussed above, I estimate a direct employment effect of 133.4 jobs and direct labor income of just over $10.9 million. IMPLAN estimates that direct value added from the construction phase is roughly $15.1 million, implying that roughly 43% of the nearly $35 million in construction costs will stay in Wayne County.

[5] See *Economic and Environmental Benefits of Building Solar in California*, by Peter Philips, November 10, 2014, https://laborcenter.berkeley.edu/pdf/2014/building-solar-ca14.pdf. One caveat to note is that the smallest solar project included in the CA study had a nominal size of 250 MW and the average was 590 MW. Using this estimate, therefore, requires assumptions about the linearity of the relationship between FTE jobs and MW capacity. More recent analyses by the National Renewable Energy Laboratory (2023) and the U.S. Department of Energy (2021) produce similar estimates; however, they are not based on the same quality of data. Recent filings for other utility-scale solar projects in Kentucky and neighboring states also show similar labor intensities (between 2.0 and 3.0 FTE jobs per MW).

[6] Labor Income = Employee Compensation + Proprietor Income

[7] Because Pulaski is much larger than Wayne County, regardless of whether we look at the overall economy or the size of the industry, this estimate should be much more reliable than the estimate for Wayne County. Given the same construction costs, employment and employee compensation, estimated proprietor income for Pulaski County and the state are nearly identical.

Table 3. Economic Impacts of Construction Phase

Impact	Employment	Labor Income	Value Added	Output
Direct	133.4	$10,924,362.51	$15,125,721.48	$34,969,731.00
Indirect	24.2	$1,115,690.57	$2,210,619.39	$4,576,133.65
Induced	25.93	$1,044,225.56	$2,297,873.60	$4,064,988.40
Total	183.53	$13,084,278.64	$19,634,214.46	$43,610,853.04
Multiplier	1.38	1.20	1.30	1.25

Source: IMPLAN model of Wayne County using 2023 economic data.

Given the direct effects, IMPLAN's model uses detailed information on inter-industry linkages in the local economy and household spending on goods and services to estimate spin-off effects. The *indirect effect* due to local businesses providing some of the supplies for the project is estimated to result in nearly $4.6 million in output, another 24.2 jobs and $1.1 million in new labor income to Wayne County. The *induced effects* from the increased consumer spending that results from new labor income adds another $4 million to output, nearly 26 more jobs and another $1 million in labor income.

Adding the direct, indirect and induced effects yields an estimated $43.6 million dollars in total economic impact from the construction of the Barrelhead Solar project. I estimate a total of 183.53 jobs will be created, and the project will bring nearly $13.1 million in new labor income. The implied multipliers are all relatively small because both the indirect and induced effects are small. The indirect effect is small due to a lack of local businesses in the county that are likely to supply the construction of a solar farm, and the induced effect is small due to a lack of local retail and service firms to meet increased consumer demand.

Multi-County Regional Impacts of Construction

In the main analysis above I focused solely on impacts of construction in Wayne County; however, some readers may be interested in wider regional impacts. While all jobs at the construction site of the Barrelhead Solar project would be counted as Wayne County jobs by Federal and state statistical agencies, there will still be spin-off activity in surrounding counties. Supplies may be purchased in nearby counties and workers may spend their new income at establishments outside of Wayne County. As a result, we would expect the indirect and induced effects to be larger when we estimate a multi-region model that includes neighboring counties.

To investigate this possibility, I built a multi-region input-output model in IMPLAN that adds the five nearby Kentucky counties that have a commuter flow into (Table 2) or out of (Table

3) Wayne County of 1% or more. That adds Wayne County's four immediate neighbors—Clinton, Russell, Pulaski and McCreary—and Cumberland County[8].

The direct effects, of course, do not change as additional counties are added; however, the indirect and induced effects increase as the larger area is able to capture more spillovers. The total economic impact increases by over $3 million to just under $46.9 million, with the implied multiplier rising to 1.34. Estimated total new jobs increases from 183.53 (Table 3) to 197.39. Total labor income would increase from approximately $13.1 million to just over $13.7 million, implying a multiplier of 1.26. Including more counties, especially a much larger one like Pulaski, does capture more of the spin-off activities from the project; however, these multipliers are still relatively modest.

Local Economic Impacts of the Operations Phase

Once the project is operational, the developer estimates that three to seven full-time employees will be needed for inspection and maintenance of equipment, as well as maintenance of the site (e.g., mowing). I will err on the conservative side of this estimate and assume the project will employ four full-time workers for ongoing operations. As noted above, I model this impact on Wayne County using the average of Metcalfe and Whitley Counties because the relevant industry—37, "Electric Power Generation – Solar"—has no data for Wayne County. This results in an estimated employee compensation per worker of $152,067 (including benefits), which is slightly below the average compensation in this industry for the state.[9]

As shown in Table 4, the model predicts larger multipliers for the operations phase than the construction phase; however, the direct effects are much smaller for the operations phase. The total economic impact of the operations phase is predicted to be $3.64 million per year. The ongoing operations are expected to add an additional 7.88 jobs and $817,384 in labor income per year.

[8] I cannot include neighboring counties in Tennessee without purchasing additional access from IMPLAN.
[9] Average employee compensation in the operations phase of a solar farm for the state is over $170,000. In contrast to the construction phase, IMPLAN estimates that there will be no proprietor income in the direct effect of the operations phase.

Table 4. Economic Impacts of Operations Phase

Impact	Employment	Labor Income	Value Added	Output
Direct	4.00	$608,266.17	$1,456,757.20	$2,591,191.38
Indirect	2.54	$151,351.98	$240,675.86	$847,358.90
Induced	1.35	$57,765.84	$116,266.10	$201,788.27
Total	7.88	$817,383.99	$1,813,699.16	$3,640,338.55
Multiplier	1.97	1.34	1.25	1.40

Source: IMPLAN model of Wayne County as a 50/50 mix of Metcalfe and Whitley Counties using 2023 economic data.

There will also be positive local economic impacts from the annual lease payments to the owners of the land the project is built on; however, that will come at the cost of some lost agricultural activity. I examine this further in Appendix 2 and I estimate that the lease payments will result in a greater increase in labor income each year than are lost from decreased farming.

Local Tax Revenues

Wayne County levies an occupational tax on compensation paid to anyone working in the county of 0.9%, regardless of whether they are a resident or not. The employee compensation numbers used above include fringe benefits that, for the most part, are not subject to the occupation tax. Additionally, Wayne County's occupational tax does not have specific provisions taxing net profits of business, so I assume none of the estimated proprietors' income is subject to the occupation tax.

I estimate that $6,708,366 in wages and salaries from the direct effects of construction phase will be subject to the occupational tax based on the state average fringe rate of 18% for the construction industry. Because the new employee compensation associated with indirect and induced effects will be spread across a range of industries, I use the overall average fringe benefit rate for the state (19%) to estimate another $1,612,403 in wages and salaries from spin-off activities in the year of construction. Applying Wayne County's occupational tax rate to these numbers implies that the construction phase of the project will yield $74,887 in occupational taxes for the county.

Looking at occupational taxes each year from ongoing operations, the first thing to note is that all the estimated labor income from the operations phase would be employee compensation. The UC-Berkeley study cited above suggests a fringe rate for workers in solar power generation of around 32%, which would imply $460,808 in taxable wages and salaries from the direct effect of ongoing operations. Using the state average fringe rate of 19% again, I estimate there will be another $189,916 in taxable compensation each year

from the spinoff activities of ongoing operations. Bringing these numbers together suggests that the ongoing operations of the project will yield another $5,857 of occupational taxes in each year the project is operational. Over the 40-year life of the project and including the construction phase, occupational taxes would total $309,167.

The issue of property taxes paid on the parcels at the project site is more complicated; however, simply converting the land from farm use to commercial will increase property taxes paid dramatically. The property tax paid on the four parcels of land at the site totaled just over $2,000 in 2024 because the land is taxed based on its agricultural value, not its total fair cash value. Even if the solar project did not otherwise increase taxable value of these parcels, which it most likely would, simply taxing the parcels based on current fair cash value would result in more than a five-fold increase in property taxes paid on the parcels each year. Most of any increased taxes on real estate will go to Wayne County Public Schools.

The project will also involve improvements to the land, a substantial increase in the amount of tangible personal property, and very large investments in solar panels and other equipment classified as “manufacturers’ machinery”. Table 5 shows how each of those categories would be taxed by the County and state governments. Manufacturers’ machinery—including panels, inverters, transformers and DC hardware—will comprise a large share of the total CapEx of roughly $80 million, but it will be taxed only by the state at a rate of 15 cents per $100. Tangible person property—including AC transmission equipment and security, control and monitoring systems— will be a smaller part of the total investment; however, the county taxes this category at a rate of 112.24 cents per $100 and the state taxes it at a rate of 45 cents per $100.

Table 5. Wayne County Property Tax Rates
in cents per $100 valuation

Taxing Jurisdictions	Real Estate	Tangible Personal	Manufacturer's Machinery
Extension Services	9.00	19.99	
General Fiscal Court	11.90	31.77	
Health	3.50	3.00	
Library	7.90	8.88	
Soil Conservation	3.02	0.00	
Wayne County Public Schools	44.00	48.60	
County Total	79.32	112.24	
State of Kentucky	11.40	45.00	15.00
County + State Total	90.72	157.24	15.00

Source: Kentucky Department of Revenue

Finally, it is worth pointing out that solar projects like this tend to require very little in the way of public services. Furthermore, given how few employees are expected to be hired to support the ongoing operations of the project, it is unlikely that the project will add noticeably to the number of students in Wayne County's schools. Therefore, an enormous majority of the tax revenue brought to the County by the Barrelhead Solar project will be spent on residents who have no direct connection to the project.

Appendix 1. Demographic and Economic Characteristics of Wayne County		
	Wayne County	**Kentucky**
Total population	19,592	4,510,725
Median age (years)	43.4	39.1
Percent 65 years and over	21.2%	17.0%
Percent White	92.4%	83.7%
Hispanic or Latino (of any race)	4.4%	4.7%
Veterans (civilian pop 18+)	6.4%	6.8%
Percent with disability, noninstitutionalized	25.3%	17.7%
High school attainment rate, 25 & older	79.4%	88.5%
Bachelor's degree attainment, 25 & older	13.7%	27.0%
Number of households	8,028	1,791,991
Average household size	2.41	2.45
with broadband Internet	82.4%	87.2%
Median household income (dollars)	$41,933	$62,417
Percent of Population in Poverty	24.3%	16.1%
Employment Status (16 & older)		
In labor force	47.0%	59.6%
Civilian labor force	47.0%	59.2%
Employed	44.7%	56.4%
Unemployed	2.3%	2.9%
Not in labor force	53.0%	40.4%
Unemployment Rate	4.9%	4.8%
Mean commuting time (minutes)	23.7	24.0
Occupation		
Management, business, science, & arts	24.7%	37.1%
Service occupations	14.6%	15.4%
Sales and office occupations	26.5%	20.3%
Natural resources, construction, and maintenance	9.1%	8.8%
Production, transportation, and material moving	25.0%	18.4%
Industry		
Agriculture, forestry, fishing and hunting, and mining	3.7%	1.8%
Construction	5.5%	6.3%
Manufacturing	18.8%	14.3%
Wholesale trade	1.2%	2.2%
Retail trade	11.6%	11.8%
Transportation and warehousing, and utilities	6.5%	6.9%
Information	0.6%	1.3%
Finance and insurance, real estate and rental	4.7%	5.6%
Prof., scientific, and mgmt; and admin and waste mgmt	8.5%	9.0%
Education, and health care and social assistance	23.2%	24.2%
Arts, entertainment, and rec; and accommodation and food services	7.3%	8.0%
Other services, except public administration	2.9%	4.5%
Public administration	5.4%	4.2%

Source: US Census Bureau, American Community Survey, 5-year profile, 2019-2023.
https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/

Appendix 2

The conversion of agricultural land to a solar farm brings substantial benefits to the local economy, but it does come at a cost. The *costs* involve reduced farming activity, as well as reduced business for any local suppliers of seed, fertilizer, feed, equipment and labor. Most of the *benefits* of the project—one-time impacts of construction, ongoing impacts of operation, and increased tax revenues—are described in the body of the report; however, another benefit is the impact of annual lease payments to the landowners. This not only includes the new income received by the landowners, but also regional spinoff impacts from the some of that income being spent on goods and services in the local economy.

In this appendix, I attempt to account for lost agricultural activity and the new lease payments to estimate the net economic impact of the change in land use. No direct accounting information is available on actual farm operations at the solar site, but rich data are available on farmland activity at the county level. I use county data on crop yields, livestock production and prices to estimate existing farm output that would be lost at the solar site. Additionally, annual lease payments to the farmland owners are not available; however, I use studies of typical lease payments to approximate the rate per acre. Then I use a custom IMPLAN model of the county to predict the linkages of both farm output and new lease income to the local economy.

Estimating Lost Economic Activity from Farming

The first step in estimating lost farm activity is to determine the project parcels' share of Wayne County's cropland and land for livestock. The Census of Agriculture is published every five years, with 2022 being the most recent; and provides detailed information on farming activity in all Kentucky counties. The developer estimates that 75 acres of cropland, which is evenly divided between corn and soybeans, and 140 acres of pasture will be removed from production.

Wayne County contains 38,469 acres of cropland, 87% of which is harvested. Of the harvested cropland, 6,521 acres are corn and 9,266 are soybeans. Assuming the percentage of harvested cropland on the site is the same as the county would suggest the farm accounts for 0.50% of harvested corn in the county and 0.35% of harvested soybeans. The pastureland on the site would account for 0.41% of Wayne County's total.

I assume that the farmland at the project site is typical of County farmland so that farm revenue can be estimated using countywide revenues and the percentages above[10]. The total value of corn harvested in Wayne County was $7,076,000 in 2022, the most recent year available, 0.50% of which is $35,380. The total value of soybeans harvested in the County was $6,620,000, giving us an estimated $23,170 for the project site. Finally, if 0.41% of pastureland translates to 0.41% of sales from cattle, sheep and horses, then I estimate $42,955.70 in revenue from livestock.

I use these numbers to construct a model in IMPLAN of the impact of lost farming revenues at the project site[11]. The lost soybean revenue is modeled using "Oilseed Farming" (1) as the industry, and "Grain Farming" (2) is used for lost corn production. I allocate all the estimated revenue from livestock to "Beef cattle ranching and farming" (11) because 97% of sales revenue from grazing animals in Wayne County come from beef cattle.

The result of this modeling is an estimated direct loss of $101,506 in agricultural output; but it's important to keep in mind that it is value added, not output, that stays in (or, in this case, is lost by) the county. The landowners do not keep all the revenue generated. They buy inputs and only some of the purchase price of those inputs stays in the county.

Table A presents more results from this model. The total loss of employment from the lost agricultural output would be 1.66 jobs, most of which is explained by the direct employment effect. Labor income would fall by $21,453, with most of that reduction coming from businesses that supply the farming activity. The overall loss in output due to agricultural activity lost would be $130,993; however, less than half of that lost output, only $61,438, would be lost by the county.

[10] I do not know how much of the site's current cropland is harvested or how many bushels it produces. Likewise, I don't know how many animals of which type graze of the site's pastureland, but I assume it supports a typical mix of livestock.

[11] Once again, some of the estimated parameters IMPLAN used in their model of Wayne County agriculture were unusual in a manner that suggested problems due to small sample size. To address this, I borrowed some parameters affecting direct impacts, including employment and proprietor income, from a model of Pulaski County, Wayne County's largest neighbor.

Table A. Impacts of Lost Agriculture from the Solar Project

Impact	Employment	Labor Income	Value Added	Output
Direct	1.32	$5,050.33	$46,075.68	$101,505.70
Indirect	0.3	$14,560.71	$11,306.16	$22,317.06
Induced	0.05	$1,841.63	$4,056.35	$7,170.16
Total	1.66	$21,452.67	$61,438.19	$130,992.92

Source: IMPLAN model of Wayne County using 2023 data and some Pulaski County parameters

Note that the 1.32 jobs estimated as a direct impact of farming on these parcels include the proprietors' jobs. That number counts the fact the landowners will no longer be farming the land when it counts jobs. If we considered only wage and salary employment the direct employment impact would be only 0.1.

New Income from Leasing the Land for the Solar Project

Given the confidential nature of lease payments to the landowner, I used published ranges to make an educated guess of the amount paid. A 2021 report from the University of Kentucky provides a range of $400 to $1,200 per acre for farmlands leased to solar projects[12]. I use the midpoint of this range, $800, to estimated lease payments for the 307 acres used by Barrelhead Solar, LLC.

The estimated lease payments of $245,600 will obviously increase the household income of the landowners substantially. This could be modeled in IMPLAN purely as an increase in household income, which would have predictable induced effects; however, such lease payments are sometimes also used to pay off debt. As a result, I present two sets of results: one that assumes the lease payments purely represent an increase in household income, and a second that assumes the lease payments are allocated 50/50 to household income and debt repayment[13]. In both cases, I will assume the household receiving the new income previously had an income between $70k and $100k.

Table B presents results from the scenario in which the landowner has no debt, and the entirety of lease payments are treated as increased household income. This has no direct or indirect impact on the county; however, the fact that some of the new income will be

[12] Davis, A. "Solar Farming Considerations." Economic and Policy Update (21):5, Department of Agricultural Economics, University of Kentucky, May 28th, 2021.
https://agecon.ca.uky.edu/sites/agecon.ca.uky.edu/files/Solar%20Farming%20Considerations.pdf
[13] The 50/50 split follows the work of "Economic Impacts of a Proposed Solar Energy Project in Freeborn County, Minnesota", by Brigid Tuck, University of Minnesota Extension, April 2021
https://conservancy.umn.edu/items/19f41ad8-f362-4de0-af60-12cc341cba54

spent at local businesses does create an induced effect. The result is an increase of 0.83 jobs, $34,292 in new labor income and $71,263 in value added.

Table B. Estimated Impacts of Lease Payments

Impact	Employment	Labor Income	Value Added	Output
Direct	0	$0.00	$0.00	$0.00
Indirect	0	$0.00	$0.00	$0.00
Induced	0.83	$34,292.04	$71,263.25	$126,880.34
Total	0.83	$34,292.04	$71,263.25	$126,880.34

Source: IMPLAN model of Wayne County using 2023 economic data

Table C presents results from the model that assumes half the lease payments are used to repay debt and the other half kept as increased household income. The debt repayment creates a direct impact on the banking industry (423, "Monetary authorities and depository credit intermediation") of $122,800, which has its own modest indirect and induced effects. As a result, the economic impact of lease payments is larger by any measure if some of the payments are used to repay debt. 1.09 new jobs and $59,192 in labor income would be created. The value added to Wayne County in this scenario is estimated to be $118,149.

Table C. Estimated Impacts of Lease Payments

Impact	Employment	Labor Income	Value Added	Output
Direct	0.43	$31,299.22	$63,087.52	$122,800.00
Indirect	0.17	$7,648.62	$12,620.18	$29,427.52
Induced	0.49	$20,243.98	$42,441.41	$75,497.99
Total	1.09	$59,191.83	$118,149.12	$227,725.52

Source: IMPLAN model of Wayne County using 2023 economic data

Note that the value added in Wayne County is greater for the lease payments than the value added lost from reduced farming in both scenarios. The same is true for labor income. The amount of money Wayne County will lose from reduced agricultural activity is less than will be gained from the lease payments, and the value of lost farming was already dwarfed by the economic impact of the solar project.

If we consider both the ongoing impacts of the solar project's operation and the positive effects of the lease payments, Wayne County comes out even further ahead. The county would not only gain 7.05 to 7.31 jobs per year, but the jobs gained would pay far more than

those lost. Labor income would increase by over $830,000 per year while the solar farm is in operation, even using the most conservative scenario for the lease payments (Table B).

Table D summarizes the total impacts of the construction and operations phases; and then calculates the total impact expected over the 40-year life of the project accounting for both lost agricultural activity and the most conservative estimates for lease payments. Over its lifetime the Barrelhead Solar project is expected to produce almost 466 job-years of employment, over $46 million in labor income and almost $92.6 million in value added in Wayne County.

Table D. Summary of Total Economic Impacts

	Employment	Labor Income	Value Added	Output
Construction	183.53	$13,084,278.64	$19,634,214.46	$43,610,853.04
Operations yearly	7.88	$817,383.99	$1,813,699.16	$3,640,338.55
40-year Total*	465.53	$46,293,213.04	$92,575,183.26	$189,059,891.84

* Accounts for effects of lease payments and lost agriculture. 40-year total employment is job-years.

Finally, note that the developer has discussed harvesting some of trees removed from the property for lumber. I do not have an estimate of how much lumber could be harvested as a result; however, this would be another (likely small) source of economic impact.

Siting Board 1-71

Refer to the Application, Attachment F, Economic Analysis. Describe the portion of construction workers expected to be hired from within Wayne County and surrounding counties.

Response: At this time, it is difficult to know what share of construction workers will come from Wayne and surrounding counties. However, industry sources and filings in other states suggest that a sizeable minority of workers (20 to 40%) used in the construction phase may come from outside of the area around Wayne County. There are two things to note in this case:

- The IMPLAN economic impact model used in the Economic Impact Analysis already attempts to account for "leakages" caused by commuting workers spending money in their home counties, as well as the fact that local businesses may be paid to provide temporary housing for workers coming from greater distances.
- The occupational tax revenue for the county will be the same from the project regardless of where the workers live.

Witness: Joshua Pinkston

Siting Board 1-72:

Refer to the Application, Attachment F, Economic Analysis at 10. Confirm that application of the "industry-specific crosswalk" to convert FTE jobs to total jobs is applicable to development of the Barrelhead Solar facility, given that construction of solar facilities likely requires a wide variety of different skilled workers over the approximately one-year construction period.

Response: The industry-specific crosswalk used to convert FTE jobs to total jobs is based on IMPLAN's data for industry 47, "Construction of new power and communication structures," which was used for all construction-phase estimates. This data is based on both the variety of worker types used for the construction of such projects, as well as the proportion of each type. It is important to note that IMPLAN's job definition is "job-years". This adjustment only accounts for the fact that a very small proportion of these jobs might be part-time.

A revised Economic Impact Analysis report that includes this information is provided as Attachment 1-70.

Witness: Joshua Pinkston

Siting Board 1-73:

Refer to the Application, Attachment F, Economic Analysis at 10. Explain the applicability and relevance of including proprietor income in the estimate of total labor income for construction of the Barrelhead Solar facility, especially given that many workers and materials may come from outside of Wayne County.

Response: Proprietor income is always included in IMPLAN estimates of labor income, as well as any other estimates of local economic impact. It only includes income expected to be paid to proprietors located in the county, not payments made to firms from elsewhere to work on the project.

Witness: Joshua Pinkston

Siting Board 1-74:

Refer to the Application, Attachment F, Economic Analysis at 12, Table 4. State the assumed annual labor income per full-time operational employee. State whether that amount also includes benefits.

Response: Using the IMPLAN model, the assumed annual labor income per full-time employee is estimated to be $152,067 (including benefits), which is slightly below the average compensation for this industry for the state. See page 12 in the revised Economic Impact Analysis report, provided as Attachment 1-70.

Witness: Joshua Pinkston

Siting Board 1-75:

Refer to the Application, Attachment F, Economic Analysis at 12, Table 4. Explain whether the estimated direct labor income of $608,000 per year includes proprietor income, similar to the analysis of the construction phase.

Response: Average employee compensation in the operations phase of a solar farm for the state is over $170,000. In contrast to the construction phase, IMPLAN estimates that there will be no proprietor income in the direct effect of the operations phase. (See Attachment 1-70 for a revised Economic Impact Analysis report.)

Witness: Joshua Pinkston

Siting Board 1-76:

Refer to the Application, Attachment F, Economic Analysis at 12, Table 4. Explain whether the estimated annual output of $2.6 million is an estimate of annual Project O&M expenditures, with $1.46 million staying in Wayne County.

Response: The nearly $2.6M of direct output in Table 4 is not the annual O&M spending. It is IMPLAN's estimate of total annual output (electricity sold) associated with operating this solar project. The $1.46M value added is the share of the total output of the solar project that is expected to stay in Wayne County.

Witness: Joshua Pinkston

Siting Board 1-77:

Refer to the Application, Attachment F, Economic Analysis at 14. Provide estimates of total property taxes anticipated to be paid to local jurisdictions in Wayne County over the 40-year life of the Project.

Response: The revised Economic Impact Analysis report (Attachment 1-70) incorporates projections from the accountant in both the text and the introduction, using both the IRB and non-IRB numbers.

Witness: Joshua Pinkston

Siting Board 1-78:

Refer to the Application, Attachment F, Economic Analysis. Provide a summary table showing the estimated net economic impact (1) in the year of construction; (2) annually during the operational period; and (3) cumulative over the 40-year Project life, accounting for impacts related to the construction and operation of the solar facility, changes in agricultural operations and effects of lease payments.

Response: A summary table has been added to the appendix in the revised Economic Impact Analysis report, provided as Attachment 1-70. The introduction to the report has also been updated to include 40-year totals.

Witness: Joshua Pinkston

Siting Board 1-79:

Explain whether the Applicant has had any conversations with Wayne County officials regarding the potential for an Industrial Revenue Bond (IRB).

Response: Barrelhead Solar is pursuing an IRB and Payment in Lieu of Taxes (PILOT) agreement with Wayne County. The IRB would provide the Project with savings on state property taxes. It would provide an opportunity for Barrelhead Solar to increase net benefit and tax revenues paid to Wayne County via PILOT.

Barrelhead Solar has had preliminary discussions with Wayne County Judge Executive Scott Gehring about the IRB/PILOT process and is scheduling follow up discussions with County officials.

Witness: Trudie Grattan

Siting Board 1-80:

Refer to the SAR, Appendix E, Noise Analysis at 14. Explain whether Barrelhead Solar will coordinate with the cemeteries (NR-01 and NR-05) to limit construction activities during funerals.

Response: Barrelhead Solar will coordinate with the pastor(s) of the cemeteries. The pastor(s) will have both Barrelhead Solar and EPC contact information to identify if any funeral activities are being planned, so that construction activities can be limited to non-noise generating activities during those times.

Witness: Trudie Grattan

Siting Board 1-81

Refer to the SAR, Appendix E, Noise Analysis at 14. Explain whether Barrelhead Solar will coordinate with Fairview Church to limit construction activities during services, bible studies, and other church-related events, including funerals.

Response: Barrelhead Solar has not been in communication with the church thus far but is committed to working with the pastor of the Fairview Church to avoid construction activities during Sunday services. No noise-generating construction activities are expected to occur on Sundays. Pile driving is limited to weekdays, 8 a.m. to 5 p.m. Bible studies occur on Wednesday nights after noise-generating construction activities will have ended for the day. The pastor will have Barrelhead Solar and EPC contact information to identify if any funeral activities are being planned, so that construction activities can be limited to non-noise-generating activities during those times.

Witness: Trudie Grattan

Siting Board 1-82:

Refer to the SAR, Appendix E, Noise Analysis. Provide all mitigation measures considered to limit the impact of construction noise.

Response: The following mitigation measures that would be applied during and after the construction phase to reduce and minimize noise impacts were provided in SAR, Appendix E, Noise Analysis:

- Construction activities, processes, and deliveries will be limited to the hours between 7:00 a.m. to 7:00 p.m., Monday through Saturday; construction activities that create a higher level of noise, such as pile-driving, will be limited to 8 a.m. to 5 p.m. local time, Monday through Friday. Non-noise-causing and non-construction activities can take place on the site between 6 a.m. to 10 p.m. local time, Monday through Sunday, including field visits, arrival, departure, planning, meetings, mowing, surveying, etc.
- Based on previous experience constructing solar projects, Barrelhead Solar believes that noise concerns resulting from pile driving activities are most effectively managed through limiting pile driving activities within a certain radius to certain hours during the day to avoid potentially impacting nearby receptors. To this end, Barrelhead Solar proposes to limit pile driving activities within 1,000 feet of potentially impacted receptors to a reduced period.
- If the pile-driving activity occurs within 1,500 feet of a noise-sensitive receptor, Barrelhead Solar will implement a construction method that will suppress the noise generated during the pile-driving process (i.e., semi-tractor and canvas method, sound blankets on fencing surrounding the solar site, or any other comparable method). Barrelhead Solar may forego

using noise suppression measures if it employs a panel installation method that does not use pile driving, so long as that method does not create noise levels similar to pile driving.

- Barrelhead Solar plans to notify residents and businesses within 2,400 feet of the project boundary about the construction plan, the noise potential, any mitigation plans, and its Complaint Resolution Program, at least one month prior to the start of construction.
- Barrelhead Solar will place panels, inverters, and substation equipment consistent with the distances to noise receptors to which it has committed in its maps and site plans.

Witness: Marty Marchaterre

Siting Board 1-83:

Provide a list of permits that will be required from any other local, state, or federal agencies for the project. Include in the response the status of those permits.

Response: The following is a non-exhaustive list of typical permits that Barrelhead Solar assumes is presently required along with an additional like of potential permits that may be required for solar projects of similar size and scope. Other permits may be required, and this list is subject to change based upon future analysis, studies, and findings.

Type	Permit	Agency	Status
Federal			
Waters of the United States (Wetlands & Streams if impacts <0.5 ac.)	Clean Water Act Section 404 Nationwide Permit No. 51	USACE	Yet to begin.
Threatened and Endangered Species	Endangered Species Act Section 7 Consultation	USFWS	Yet to begin.
Eagle Protection	Bald and Golden Eagle Protection Act	USFWS	Yet to begin.
State			
Kentucky Siting Board on Electric Generation	Siting Board Approval to Construct	KY Siting Board	Underway.
Kentucky Siting Board on Transmission Line	Siting Board Approval to Construct	KY Siting Board	Underway.
Kentucky Water Quality	Clean Water Act Section 401 Water Quality Certificate	KDOW	Yet to begin.
Construction in a Floodplain	Floodplain Permit	KDOW	Yet to begin.
Construction In, Along, or Across a Stream	Stream Construction Permit	KDOW	Yet to begin.
Cultural Resources	National Historic Preservation Act Section 106 Consultation	SHPO	Yet to begin.
Highway Access Permit (Entrance Permit)	Kentucky Access Permit	KYTC	Yet to begin.

Kentucky Overweight/Oversize Vehicle Permit	Overweight or Oversize Vehicles Using State Roadways	KYTC	Yet to begin.
State Stormwater Permits/Land Disturbance	General Permit for Stormwater Discharges Associated with Construction Activities	KDOW	Yet to begin.
Local			
Warren County Building and Electrical Permits	Building and Electrical Permits for New Commercial Construction	Warren County	Yet to begin.
Warren County Road Use and Access	Road Use, Access, Overweight or Oversized Vehicles	Warren County	Yet to begin.

Witness: Marty Marchaterre

Siting Board 1-84:

Provide copies of any documents submitted to other agencies, other than what was included in the application.

Response: No other documents not already included in the application have been submitted to local, state, or federal agencies.

Witness: Marty Marchaterre

Siting Board 1-85:

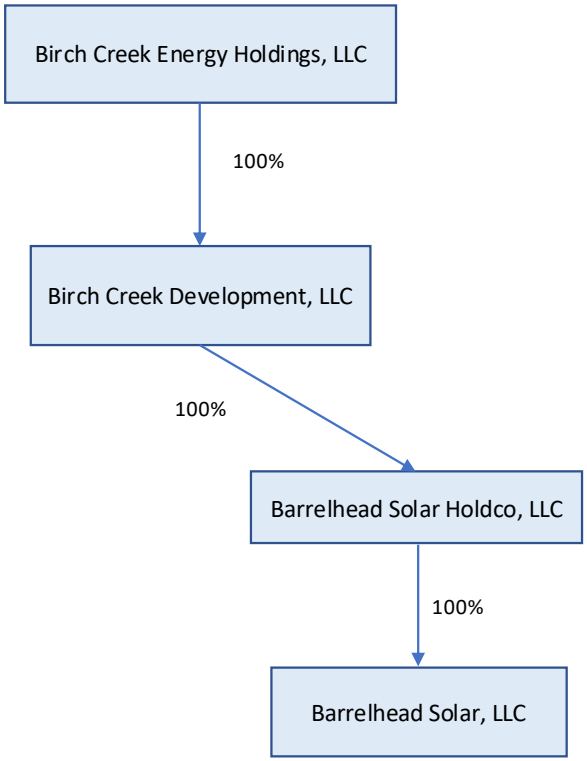
Provide the entities with a direct ownership interest in Barrelhead Solar. Also provide the corporate structure of those entities.

Response: Birch Creek Energy Holdings, LLC, Birch Creek Development, LLC, and Barrelhead Solar Holdco, LLC have direct ownership interest in Barrelhead Solar. The corporate structure of those entities is shown in Attachment 1-85.

Witness: Trudie Grattan

BIRCH CREEK

Barrelhead Organization (Pre-NTP Construction)



Siting Board 1-86:

List all churches or other religious facilities within a two-mile radius of the project. Provide the corresponding distances from the facility to the closest site boundary.

Response: The table below shows all churches and religious facilities within two miles of the Project and their corresponding distance to the Project boundary.

Facility	**Distance (feet)**
Walnut Grove Church	8,744
Fairview Church	75
Pleasant Ridge Amish Mennonite Church	2,658
Otter Creek Academy Church	6,419
Old Bethel Bible Church	4,196
Highway Holiness Church	7,563
Gap Creek Baptist Church	9,733
Lighthouse Temple	5,499
Soul Harbor Church of God	7,530
Davis Chapel	4,030

Witness: Marty Marchaterre

Siting Board 1-87:

Provide any communication with any churches or other religious facilities regarding the project. Provide any concerns that were raised.

Response: Barrelhead Solar reached out to both Fairview Church and Pleasant Ridge Amish Mennonite Church via mailers in August and September 2025. It sent two rounds of letters and did not receive any response to the outreach.

Barrelhead Solar plans to reduce potential visual impacts on churches by planting a vegetative buffer to provide screening.

Witness: Marty Marchaterre

Siting Board 1-88:

The proposed Project site sits in a karst prone region with high groundwater sensitivity levels. Provide any mitigation measures Barrelhead Solar will implement during construction and operations in response.

Response: A preliminary geophysical survey was completed, which is provided as Attachment 1-92. The survey generally did not show evidence of karst across the Project Area. Because karst is prevalent across Kentucky, the conclusion was that karst is a low to moderate concern for design and construction of the Project.

The report indicated that this risk may be minimized by the remediation of near-surface sinkhole features when encountered during construction. Additional geophysical investigation in areas where heavily loaded foundations, poles, slabs, or other structures may be installed is recommended. It was also recommended that a Karst Mitigation Plan with a sinkhole repair plan be prepared prior to the start of construction to allow for proper planning on managing these conditions. In addition, as with all karst sites, the proper control of surface water, design of stormwater management basins, and minimizing and matching the native flow direction, velocity, and quantity of infiltration is necessary to avoid aggravating and accelerating naturally occurring ground subsidence. The report recommends that a civil engineer experienced in design on karst sites properly plan and implement surface water and groundwater controls to limit the increase in karst activity caused by the planned site development. If remediation of existing open sinkholes is required, the excavation and backfilling of any features should be designed by a qualified geotechnical engineer and/or karst expert.

As recommended in the preliminary report, Barrelhead Solar plans to complete a traditional geotechnical investigation (soil borings, test pits, pull-out tests, etc.) prior to construction to

calibrate and refine the understanding and risk across the Project Area. Barrelhead Solar and the EPC will further identify any necessary mitigation measures.

Witness: Trudie Grattan

Siting Board 1-89:

Explain whether any existing structures on the project site will be demolished during construction.

Response: Barrelhead Solar will prepare a demolition study prior to construction to determine whether any structures would be demolished as part of the Project.

Witness: Trudie Grattan

Siting Board 1-90:

Provide the total length of cabling to be used in the projects' collection system.

Response: See Site Application Attachment G - Decommissioning Plan, which estimates that approximately 13,057 linear feet of cabling would be required for the solar infrastructure

Witness: Trudie Grattan

Siting Board 1-91

Provide information on all electric transmission lines that intersect the project. Include in the response the owner, voltage, status, and right-of-way (ROW) setbacks.

Response: Please see below table identifying ROW owners, estimated widths, and voltages. These values will be verified prior to construction.

ROW Owner	ROW Width	ROW Voltage (Estimated)
Kentucky Rural Electric Cooperative Corporation (now East Kentucky Power Cooperative)	100 feet	69 kV
Kentucky Rural Electric Cooperative Corporation (now East Kentucky Power Cooperative)	100 feet	69 kV
Kentucky Rural Electric Cooperative Corporation (now East Kentucky Power Cooperative)	50 feet	34.5 kV or 12 kV

Witness: Trudie Grattan

Siting Board 1-92:

Provide any karst studies for the project.

Response: A preliminary geophysical report has been completed and is provided as Attachment 1-92.

Witness: Trudie Grattan

PRELIMINARY GEOPHYSICAL INVESTIGATION REPORT

Barrelhead Solar Project
Wayne County, Kentucky

July 21, 2022

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Appendices

Appendix A - Geophysical Investigation Survey Location Plans
Appendix B - Electrical Resistivity Imaging (ERI) Profiles

1 Executive Summary

ANS Geo was retained by Pine Gate Renewable to complete a preliminary geophysical investigation to evaluate the presence/absence of potential karst conditions at the Barrelhead Solar project site located in Wayne County, Kentucky. The results and interpretation of our geophysical Surveys are detailed within this report.

Based on our review of available information, we identified that the project site is mapped by the United States Geological Survey (USGS) and Kentucky Geological Survey (KGS) as being underlain by sedimentary rocks of Mississippian, Pennsylvanian, and Quaternary age. The Barrelhead site lies predominately within the Mississippian age limestones, which consists of Ste Genevieve limestones, St. Louis limestones, Salem and Warsaw formations as well as the Fort Payne formations. These rock types are known for their high susceptibility of karst formation. To better evaluate the presence or absence of karst anomalies at the project site, ANS Geo completed a limited geophysical investigation program consisting of Electrical Resistivity Imaging (ERI) to confirm the presence and characterize the type of karst at select locations across the site. The geophysical program was not an exhaustive evaluation of the entire site, but instead, was intended to gain a *general* understanding of the subsurface conditions and the impact of karst on the design, siting, and construction of the project.

ANS Geo completed the ERI geophysical survey at the site between the dates of June 16 and 19, 2022. In total, nine (9) ERI survey transects were completed at dispersed locations within the proposed project array areas.

The surveys conducted generally showed uniformity in the subsurface across the site; namely, they were consistent on observations of dry, coarse-grained predominant soils (ie gravel and sand) in the upper 10 to 20 feet which were underlain by moist/wet clay and silt predominant soils. With exception to ERI-3, bedrock was not observed within the ERI surveys, up to the ERI investigation depths of approximately 50 to 60 feet. Within the ERI-3 survey, bedrock appeared to be at approximately 20 feet below ground surface. Top of competent bedrock is more than likely 60 feet below grade or greater across most of the project site.

From our review, little to no apparent karst formations are believed to exist at locations where ERIs were completed. Within ERI-8, potential “ravelling” of sols may have occurred. This can be an indication of deeper karstic movement and subsidence of shallower soils. As these soils have filled in any prior dissolution, there is no active concern for site development at this location. The location of these surveys, have been provided on the Investigation Location Plan as **Attachment A**.

Based on our preliminary evaluation of the geophysics results, it is our opinion that karst is a low to moderate concern to design and construction across the broader project boundaries. While no karst features were observed during the geophysics survey, the survey was limited to site-specific locations, and it is possible that karst can still exist at other, non-surveyed locations across the project boundary. Nonetheless, the survey completed has reduced expected risk. The risk of karst may also be minimized across the site by the remediation of near-surface sinkhole features when encountered during construction. Since ANS Geo conducted geophysical investigations at specific, discrete locations across the site, it is possible that karst and subsidence risk may be higher than observed in our tested areas.

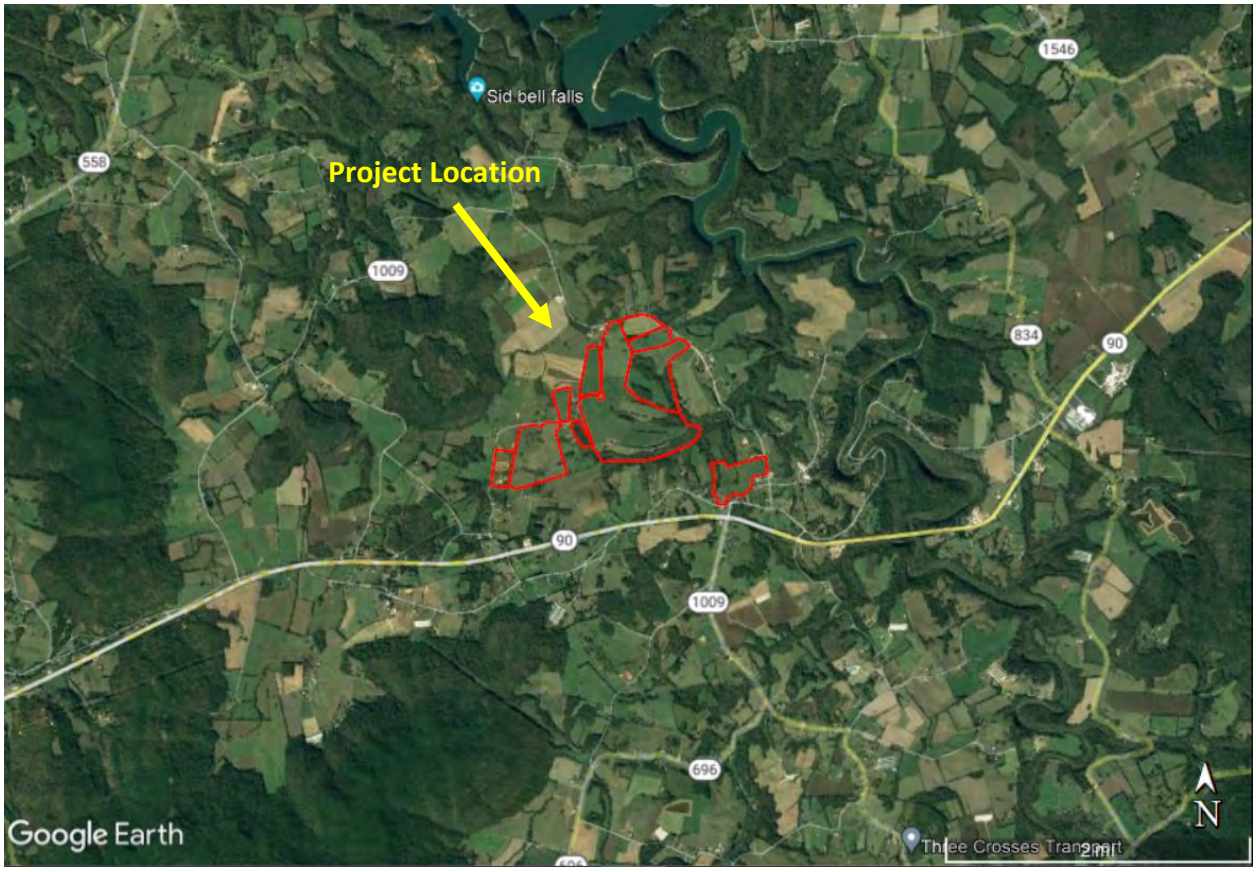
ANS Geo does recommend that a Karst Mitigation Plan with sinkhole repair plans be prepared prior to the start of construction, to allow for the proper planning on managing any possible karst features uncovered during construction. In addition, as with all karst sites, the proper control of surface water, design of stormwater management basins, and minimizing and matching the native flow direction, velocity, and quantity of infiltration is necessary to avoid aggravating and accelerating naturally occurring ground subsidence. ANS Geo recommends that a civil engineer experienced in design on karst sites properly plan and implement surface water and groundwater controls to limit the increase in karst activity caused by the planned site development.

2 Introduction

ANS Geo was retained by Pine Gate Renewables to complete a geophysical investigation to evaluate potential karst conditions at the Barrelhead solar facility project site in Wayne County, Kentucky. ANS Geo conducted an initial geologic Desktop Study for identifying areas prone to the potential for karst features such as sinkholes near the project area.

As part of our prior Desktop Study evaluation and field investigation data, ANS Geo prepared a map of potential sinkhole locations based on publicly available data, along with cross-referenced historic aerial photography. ANS Geo proposed a geophysical investigation program consisting of Electrical Resistivity Imaging (ERI) to evaluate the presence/absence of potential karst conditions at select representative locations across the site. The geophysical investigation was intended to gain a general understanding of the subsurface conditions and gauge the preliminary impact which karst geohazards may or may not contribute to the design, siting, and construction of the proposed solar farm. Figure 1 below depicts a project vicinity map.

Figure 1: Project Vicinity Map



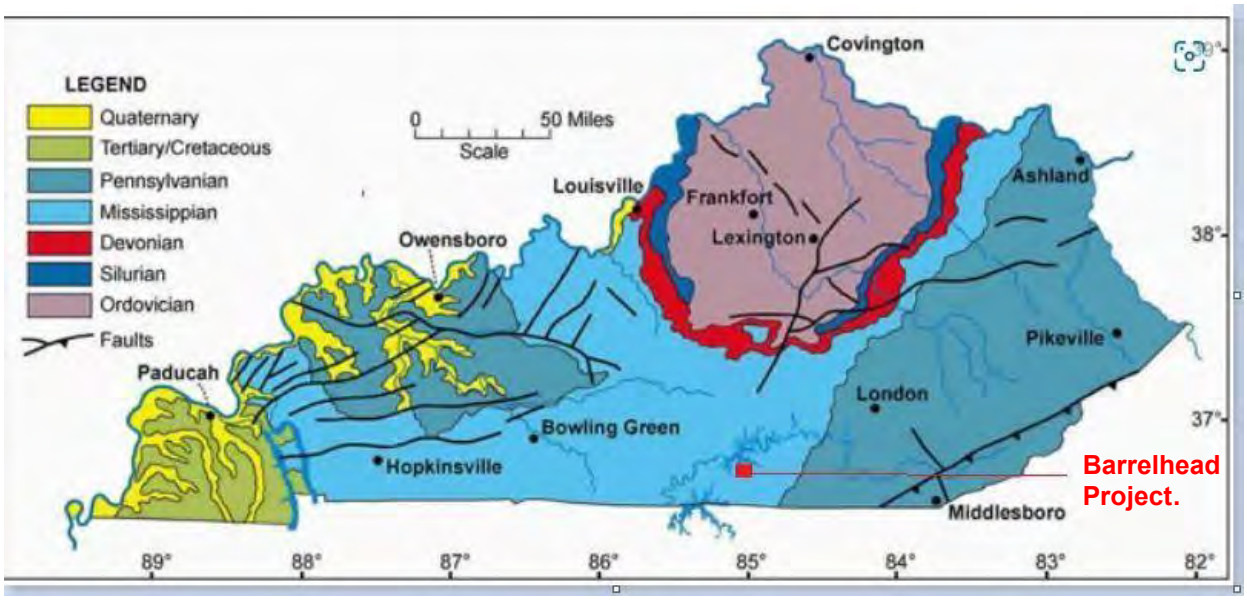
Source: Google Earth Imagery 2022

3 Background Geology

Prior to site mobilization, ANS Geo conducted a brief desktop review of surficial and bedrock geology maps and reports made available by the United States Geological Survey (USGS) and Kentucky Geological Survey (KGS). Figure 2, provided below, indicates the project site is underlain by Mississippian age limestones consisting mostly of Ste. Genevieve limestones formations, St. Louis limestones formations, Salem/Warsaw formation and Fort Payne limestones formations.

The St. Louis formation is exposed on the surface of the majority of the project area. Quaternary age unconsolidated alluvium deposits and Mississippian age sandstones and siltstones were also exposed within the project area. The Mississippian sandstones and siltstones are the result of a great influx of mud, silts, and sands brought in by rivers and streams from uplands many miles away and deposited as a great delta.

Figure 2: Project Vicinity Map within the Mississippian age Limestones.



Source: Kentucky Geological Survey 2019

Overburdened soil information reviewed within the project area were Ultisols, Inceptisols, Alfisols and Mollisols soils. Alfisols are moderately leached, relatively deep soils, characterized by a sub-surface accumulation of silicate clays and moderate to high base saturation. Ultisols are generally considered to be older soils and more weathered than Alfisols, Soils in the south-central part of the state are more representative of the Ultisol model showing significant base leaching, argillic horizons and redder hues than Alfisols. Inceptisol soils are often present on landscapes where the process of soil development is slowed either by relatively steep gradients, young geomorphic surfaces, or resistant parent materials. Mollisols are characterized by thick dark brown to nearly black color surfaces resulting from accumulation of organic matter. Their subsoil is high in bases. Many of Kentucky's Mollisols were formed in old prairie landscapes but incur accelerated erosion due to modern agricultural practices which have also converted a significant number of these soils to alfisols.

3.1 Aerial Imagery Evaluation for Previous On-Site Subsidence Events

ANS Geo reviewed photogrammetry (aerial imagery) of the project site using current and historical imagery available from Google Earth to develop a partial understanding of potential subsidence events that have occurred or are currently active within the project boundaries. Potential subsidence incidences can sometimes be identified by reviewing site topography, looking at the shading on the ground surface of aerial images, surface water drainage pathways, and looking for pooling or standing water. A review of aerial imagery and literature from Kentucky Geological survey shows areas of "intense karst" across the project site county (figure 4). According to our review of the geologic map of Kentucky, the proposed site is within an area of high potential for karst (figure 3). However, the aerial imagery does not show any indications of karst at ground surface.

Figure 3: Project Setting In Relation to Kentucky State Karst Areas

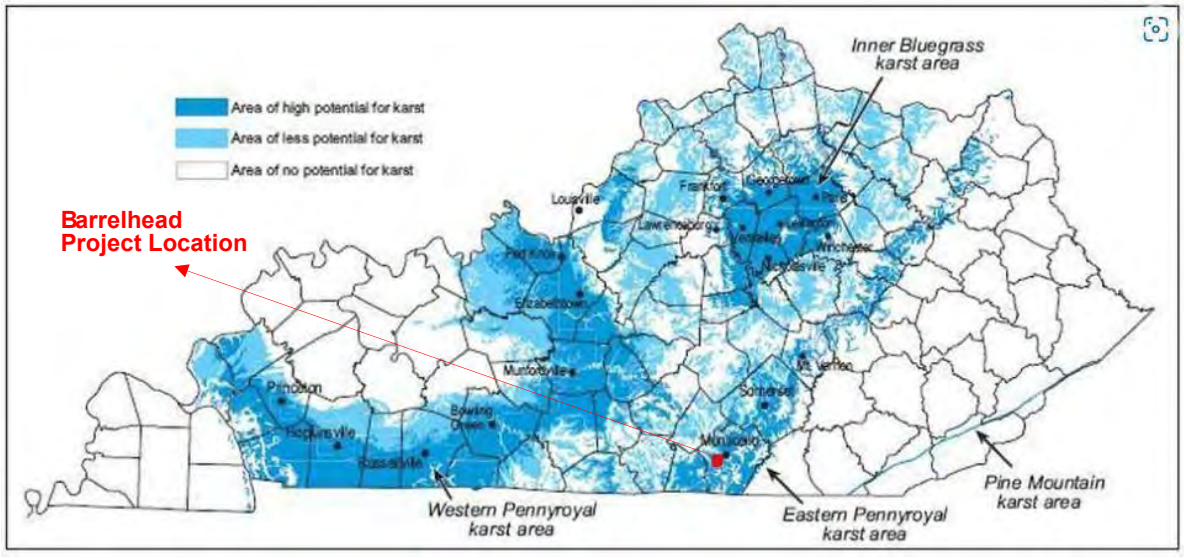
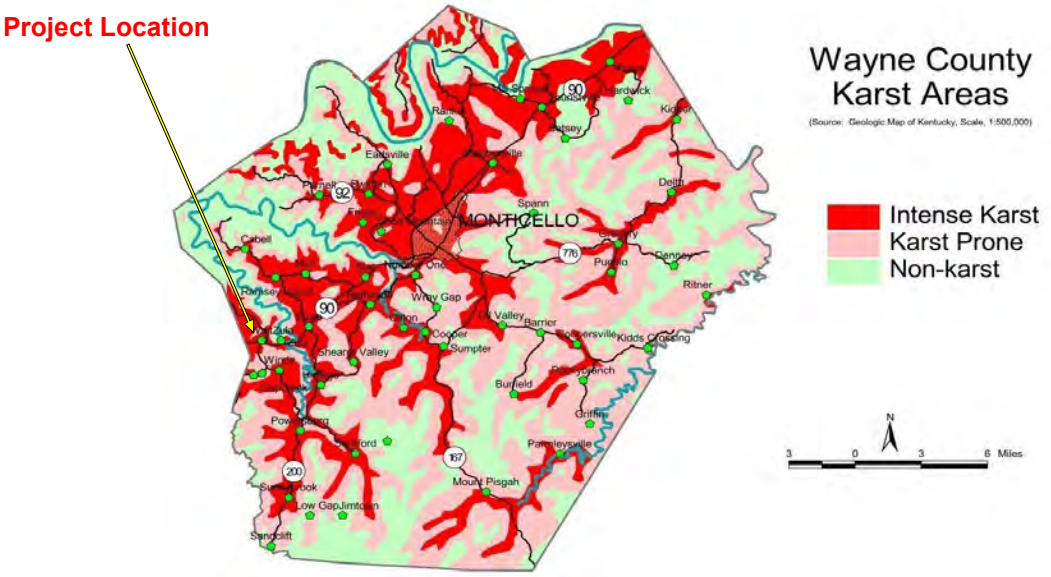


Figure 4: Project Setting in Relation to Wayne County Karst Areas



3.2 Field-confirmed Karst Depressions

ANS Geo noted that the project site exists within the Mississippian Limestone formations, which are susceptible to karst geology. Karst geology includes regions where the topography is formed and altered by the dissolution of bedrock (commonly limestone or dolomite). Karst landscapes are commonly characterized by features such as surficial depressions, sinkholes, sinking streams, subsurface drainage, springs, and caves. Prior to performing geophysical testing, our crew completed a site walkthrough to determine representative locations for testing. The walkthrough consists of a search for topographic features indicative of karst formations beneath the surface. These features include sinkholes, surface depressions, disappearing and appearing streams, and open-throat holes. Our field staff did not locate any such blatantly visible features in the project area during our limited site reconnaissance.

It is understood that sinkhole formation and karst is aggravated by change in surface drainage, change in groundwater flow quantity or direction, or increase in infiltration to the subsurface. As is typical with solar developments, most of the topography will remain unchanged since cut and fill will be minimized. In addition, it is not expected that the array areas will be stripped of grass or vegetation or be denuded during construction. By minimizing cut and fill, and limiting the change to existing vegetative cover, the hydrology and runoff will remain mostly consistent to pre-development conditions. Therefore, the risk of increasing sinkhole development potential is minimized but not completely removed due to photovoltaic development.

4 Field Investigation

ANS Geo completed ERI geophysical testing at the site on June 16 through 19, 2022. The ERI methods used for this investigation were a combination of Dipole-Dipole and Strong Gradient. The methods were completed using an array of electrodes positioned in a linear fashion along the proposed survey locations. In total, nine (9) ERI surveys were completed within the project area. For detailed discussions on the methodology please refer to **Section 5**.

ANS Geo has provided a Location Plan as **Attachment A** which shows the location of all geophysical survey transects (lines) as they correspond to the proposed photovoltaic facility layout available at the time of our survey. **Figures 1** through **9**, provided as **Attachment B,** represent each of the nine surveyed locations.

Table 1 summarizes the geophysical method and ID number, reporting Figure number, distance, and orientation of each line, as well as their spacing distances used for ERI testing.

Table 1 – Geophysical Survey Parameters

Method-ID	Figure No.	Profile Orientation	Survey Distance (ft)	Electrode/Geophone Configuration/Qty	Electrode/Geophone Spacing (ft)
ERI-1	1	North to south	275	56	5
ERI-2	2	Northwest to southeast	270	28	10
ERI-3	3	Northwest to southeast	270	28	10
ERI-4	4	South to north	275	56	5
ERI-5	5	East to west	275	56	5
ERI-6	6	Southeast to northwest	270	28	10
ERI-7	7	East to west	270	28	10
ERI-8	8	Southwest to northeast	270	28	10
ERI-9	9	East to west	135	28	5

5 Geophysical Investigation Method

5.1 Electrical Resistivity Imaging (ERI)

Electrical Resistivity Imaging (ERI) is a geophysical method that measures electrical resistivity in soil and rock based off the principles of Ohm's Law. Data obtained through an ERI investigation acquires a series of voltage and current measurements from surface electrode arrays. The electrode arrays consist of a series of dipoles that communicate with other dipoles. The arrays can be spaced close or far apart depending on necessary survey resolution. Resistivity is dependent on the material property and geometry and thus is measured in Ohm-meters.

5.1.1 Theory

Electrical resistance is based upon Ohm's Law:

$$R = \frac{V}{I} \quad [ohms]$$

Where, resistance, R, is equal to the ratio of potential, V (volts) to current flow, I (amperes).

Resistivity is the measure of the resistance along a linear distance of a material with a known cross-sectional area. Consequently, resistivity is measured in Ohm-meters. This Report presents the geophysical results as geo-electrical profiles of modeled resistance plotted as two-dimensional profiles of distance and depth, in units of feet.

Electrical currents propagate as a function of three material properties: (1) ohmic conductivity, (2) electrolytic conductivity, and (3) dielectric conductivity. Ohmic conductivity is a property exhibited by metals. Electrolytic conductivity is a function of the concentration of total dissolved solids and chlorides in the groundwater that exists in the pore spaces of a material. Dielectric conductivity is a function of the permittivity of the matrix of the material. Therefore, the matrix of most soil and bedrock is highly resistive. Of these three properties, electrolytic conductivity is the dominant material characteristic that influences the apparent resistivity values collected by this method. In general, resistivity values decrease in water-bearing rocks and soil with increasing:

a. Fractional volume of the rock occupied by groundwater.
b. Total dissolved solid and chloride content of the groundwater.
c. Permeability of the pore spaces; and,
d. Temperature.

Materials with minimal primary pore space (i.e., limestone, dolomite) or those which lack groundwater in the pore spaces will exhibit high resistivity values (Mooney, 1980). Factors contributing to low resistivity:

- Degree of water bearing void space within soil and rock (only if water exists).
- Chloride content of water bearing within soil and rock pore space.
- Available pore space within material (i.e., low pore space will decrease resistivity).
- Temperature

Highly porous, moist, or saturated soil will exhibit very low resistivity values. Additionally, high resistivity values will result from generally inverse conditions (i.e., highly porous and dry conditions). This is, of course, a range, and most earthen materials falls within the range of low to medium resistivity depending on their properties. For these reasons, cavities, voids, highly fractured bedrock and groundwater can often have definable values observed through the methods of ERI. In homogeneous ground, the apparent resistivity is the true ground resistivity; however, in heterogeneous ground, the apparent resistivity represents a weighted average of all formations through which the current passes.

5.1.2 Methods

Different acquisition algorithms can be implemented during an investigation. For this investigation, the Dipole-Dipole / Strong-Gradient array combination methods, which have proven to be an effective configuration for imaging voids in shallow bedrock settings, were implemented. The measurements were collected to create a two-dimensional image. The image is developed using an inversion algorithm. The inversion algorithm uses the collected apparent resistivity data to create a model space of resistivity values that would replicate the collected data.

While homogeneous ground conditions represent the true apparent ground resistivity, non-unique values represent a weighted average of the multiple formation variations (Reynolds, 1997). Apparent resistivity values are computed with a forward modelling subroutine, and a smoothness-constrained least-squares optimization routine, creating a pseudosection using finite-difference or finite-element approaches. The pseudosection model is compared to the actual measurements for consistency. A measure of the inversion progress and difference is given by the root-mean-squared error.

5.1.3 Data Collection and Data Processing

Nine (9) ERI profiles were acquired using an AGI SuperSting R8 Resistivity meter. Three (3) of the ERI surveys were completed with a 56-electrode setup at 5-feet spacings. Five (5) ERI surveys were acquired in conjunction with a 28-electrode setup at 10-foot spacings. One (1) ERI survey was acquired in conjunction with a 28-electrode setup at 5-foot spacings. Measurements were obtained through a combined Dipole-Dipole and Strong Gradient paired array setup. Locational data were recorded using a Trimble Geo7X global positioning system.

The approximate depth of penetration of the survey is contingent on a few factors, most of which relate to the overall survey line length. The 28-electrode setup at 10-foot spacings and 56-electrode setup at 5-foot spacings generally obtained an approximate penetration depth of 60 feet below ground surface while the 28-electrode setup with 5-foot electrode cable spacings, reached a depth of approximately 30 feet below ground surface. Two-dimensional profiles have been provided within Attachment B.

6 Geophysical Analysis

Carbonates (limestone and dolomite) that matures within karstic or dissolution prone conditions often undergo a variable maturation process. When younger, the features represent small caves, short caves, and uniform rockhead. As the karst matures, so does its complexity. Cover-subsidence and cover-collapse sinkholes, irregular or pinnacled rockhead, buried sinkholes, all become more prevalent. These types of occurrences usually reveal themselves at the ground surface through shallow or deep, bowl-like expressions that are generated when near-surface or subsurface subsidence and collapse occurs.

ERI methods provide indications of overall stratigraphy type and change, as well as possible anomalies such as voids or caverns, and water bearing zones. Apparent resistivity values obtained through the ERI surveys portrayed generally homogeneous subsurface geologic trends with apparent resistivities ranging from less than 50 ohm-meters to over 4,000 ohm-meters, but generally less than 200 ohm-meters. The subsurface profiles generally exhibited a shallow, up to approximately 20 feet deep, layer of coarse-grained soils (ie gravel and sand), underlain by a deeper moist/wet low resistivity clay and silt layer which exhibited resistivity values below 200 ohm-meters from approximately 20 to 60 feet below ground surface. Bedrock was not observed, with the exception of ERI-3, where bedrock is likely between 20 to 40 feet deep.

The limited geotechnical surveys which ANS Geo conducted generally did not show evidence of karst cross the site; however, the results showed potential karst features at ERI-8. The potential karst features identified consisted of “raveling” soils and floating bedrock. There were no signs of karst at ground surface in either of the survey locations.

6.1 Electrical Resistivity Imaging and Geologic Analysis

Based on our review of the limited geophysics data, the general subsurface profile appears to be a thick layer of loamy soils with abundant coarse-grained material within the upper approximately 10 to 20 feet below grade, underlain by moist or wet clay and silt.

Table 2 provides a summary of the subsurface profile, evaluated as part of our geophysical investigation.

Table 2 – Geophysics Survey Observation and Notes

Transect ID	Topographic & Geologic Setting	Inferred Depth to Top of Bedrock [feet]	Notes
ERI-1	Little to no slope	Not Encountered	Dry, predominately coarse-grained soils from approximately 0 to 20 feet below grade underlain by low resistivity, moist or wet, fine-grained soils from approximate depths of 20 to 60 feet.
ERI-2	Slightly sloping towards the beginning of the survey	Not Encountered	Dry, predominately coarse-grained soils from approximately 0 to 20 feet below grade underlain by low resistivity, moist or wet, fine-grained soils from approximate depths of 20 to 60 feet.
ERI-3	Little to no slope	~20’	Predominately fine-grained soils from approximately 0 to 20 feet below grade underlain by higher resistivity bedrock at approximately 20 feet below ground surface.
ERI-4	No slope	Not encountered	Dry, predominately coarse-grained soils from approximately 0 to 20 feet below grade underlain by low resistivity, moist or wet, fine-grained soils from approximate depths of 20 to 60 feet.
ERI-5	No slope	Not encountered	Dry, predominately coarse-grained soils from approximately 0 to 20 feet below grade underlain by low resistivity, moist or wet, fine-grained soils from approximate depths of 20 to 60 feet.
ERI-6	No slope	Not Encountered	Dry, predominately coarse-grained soils from approximately 0 to 20 feet below grade underlain by low resistivity, moist or wet, fine-grained soils from approximate depths of 20 to 60 feet.
ERI-7	Slightly sloping west to east	Not Encountered	Dry, predominately coarse-grained soils from approximately 0 to 20 feet below grade underlain by low resistivity, moist or wet, fine-grained soils from approximate depths of 20 to 60 feet.
ERI-8	No slope	Not Encountered	Dry, coarse-grained abundant soils from approximately 0 to 20 feet below grade underlain by lower resistivity, wet, fine-grained soils from approximately 20 to 60 feet. Possible “ravelling” of soils from approximately 150 to 175 feet horizontal distance along the survey, 20 to 40 feet below ground surface. Ravelling of soils may indicate that deeper karstic movement has occured.
ERI-9	No slope	Not Encountered	Dry, coarse-grained abundant soils from approximately 0 to 20 feet below grade underlain by low resistivity, wet, clay soils from 20 to 30 feet. Zone of high-resistivity, dry, coarse-grained soil from approximately 70 to 110 feet along the survey and 5 to 15 feet below ground surface.

In areas where voids have already occurred and have become soil-infilled, it is our opinion that they will not provide a significant risk to the solar project's development. Remediation may be necessary, however, if these former sinkholes and depressions with infilled soils are encountered during construction since these zones will have loose to soft soils with limited structural capacity. ERI-8 is one such location where deep past subsidence related to sinkhole formation may have previously occurred and become soil-infilled.

No surface depressions were identified on site. It is possible that features may exist which were not identified in other areas which ANS Geo did not survey. A considerable portion of the project area is being farmed. Areas that regularly undergo agricultural operations often show minimal signs of karst at the surface due to the constant disturbance to the surface by plows, tillers, and other machinery.

7 Risk Evaluation and Conclusions

ANS Geo understands that the project site is intended to support a photovoltaic development which will consist of racking and modules (panels), inverters, and other accessory structures. To aid in site planning and development, it is important to identify the relative potential for risk across certain portions of the site to help minimize the potential for siting critical project components and structures (ie. substation foundations) within these areas with higher geologic risk of settlement and movement.

Based on our preliminary evaluation of the geophysics results, it is our opinion that karst is a low to moderate concern to design and construction across the broader project boundaries. The risk of karst may be minimized across the site by the remediation of near-surface sinkhole features when encountered during construction. Since ANS Geo conducted geophysical investigations at specific, discrete locations across the site, it is possible that karst and subsidence risk may be higher than observed in our tested areas; therefore, additional geophysical investigation in areas not previously evaluated is recommended to profile areas where heavily-loaded foundations, poles, slabs, or other structures may be installed.

ANS Geo recommends that a Karst Mitigation Plan with sinkhole repair plans be prepared prior to the start of construction, to allow for the proper planning on managing these conditions. In addition, as with all karst sites, the proper control of surface water, design of stormwater management basins, and minimizing and matching the native flow direction, velocity, and quantity of infiltration is necessary to avoid aggravating and accelerating naturally-occurring ground subsidence. ANS Geo recommends that a civil engineer experienced in design on karst sites properly plan and implement surface water and groundwater controls to limit the increase in karst activity caused by the planned site development. If remediation of existing open sinkholes is required, the excavation and backfilling of any features should be designed by a qualified geotechnical engineer and/or karst expert.

Finally, it should be noted that at this stage of preliminary investigation, the intent of our work was not to identify all karst features which may exist across the project site, but rather confirm the presence/absence of karst and the type of karstic features (shallow, pinnacled rock, air-filled, water-filled, or soil-filled voids, disappearing streams, etc.). Although not included with this scope of work, at a later stage, a traditional geotechnical investigation (soil borings, test pits, pull-out tests, etc.) will need to be completed to calibrate and refine the understanding and risk across the site.

8 References

- Carey, D.I., Currens, J.C., Dinger, J.S., Kipp, J.A., Wunsch, D.R., and Conrad, P.G., 1994, Ground water in the Kentucky River basin: Kentucky Geological Survey, Ser. 11, Information Circular 52, 78 p.

- Driscoll, F.G. 1986, Groundwater and wells [2nd ed.]: St. Paul, Minn., Johnson Division, 1,089 p.

- Hopkins, H.T., 1966, Fresh-saline water interface map of Kentucky: U.S. Geological Survey, scale 1:500,000.

- Kipp, J.A., and Dinger, J.S, 1991, Stress-relief fracture control of ground- water movement in the Appalachian Plateaus: Kentucky Geological Survey, Ser. 11, Reprint 30, 11 p.

- Mabee, S.B., Hardcastle, K.C., and Wise, D.U., 1994, A method of collecting and analyzing lineaments for regional-scale fractured-bedrock aquifer studies: Ground Water, 32, no. 6, p. 884-894.

- McGrain, P., and Currens, J.C., 1978, Topography of Kentucky: Kentucky Geological Survey, Ser. 11, Special Publication 25, 76 p

9 Discussion and Limitations

ANS Geo notes that the specific karst-related findings and recommendations presented with this Report are based on a limited investigation program, and that karst is an on-going, “living” process which cannot be predicted. Any identification of karst features or recommendations are taken as a snapshot in time, and are subject to change due to natural processes that cannot be predicted. Any mapping provided by ANS Geo has been provided as a visual representation of the existing geotechnical information available to-date. Since the site is known to have karst features and pinnacled rock, it should be expected that the actual location of karst, pinnacled features, and/or depth to rock will vary from the information shown on provided mapping. The information identifying specific risk areas should not be solely relied upon for any engineering design, cost analysis, or prediction of construction conditions without additional field investigation study to confirm the presence or absence of karstic features in areas not investigated or surveyed as part of our work.

ANS Geo provides absolutely no warranties, expressed or implied, on the accuracy of this karst mapping or its fitness for use for any purpose other than to visualize the existing information collected to-date. Geophysical investigations are a non-invasive method of interpreting physical properties of the shallow earth using electrical, electromagnetic, or mechanical energy. This document contains geophysical interpretations of responses to induced or real-world phenomena. As such, the measured phenomenon may be impacted by variables not readily identified in the field that can result in a false-positive and/or false negative interpretations. ANS Geo makes no representations or warranties as to the accuracy of the interpretations. The extent of reliability of the survey is based on the specific areas where surveys were conducted; areas outside surveyed alignments may have variations in the conditions noted. We also understand that the current investigation is considered preliminary, and that additional geotechnical investigations including an appropriate number of soil borings, and associated laboratory testing of soil material have been or will be completed at each site prior to detailed design and construction.

Should the scope of the project or proposed site layout change, or more investigation area become available, ANS Geo should be given the opportunity to review the applicability of the collected information and modify our recommendations, as needed.

Attachment A

Geophysical Investigation Survey Location Plan



ANS GEO

Client:

PINEGATE RENEWABLES

INVESTIGATION LOCATION PLAN (Geophysics)

PINE GATE RENEWABLES
BARRELHEAD SOLAR PROJECT
HAPPY TOP, KENTUCKY

Legend

- Electrical Resistivity Imaging Location
- Electrical Resistivty Imaging Survey Line
- Boundary

0 450 900 ft

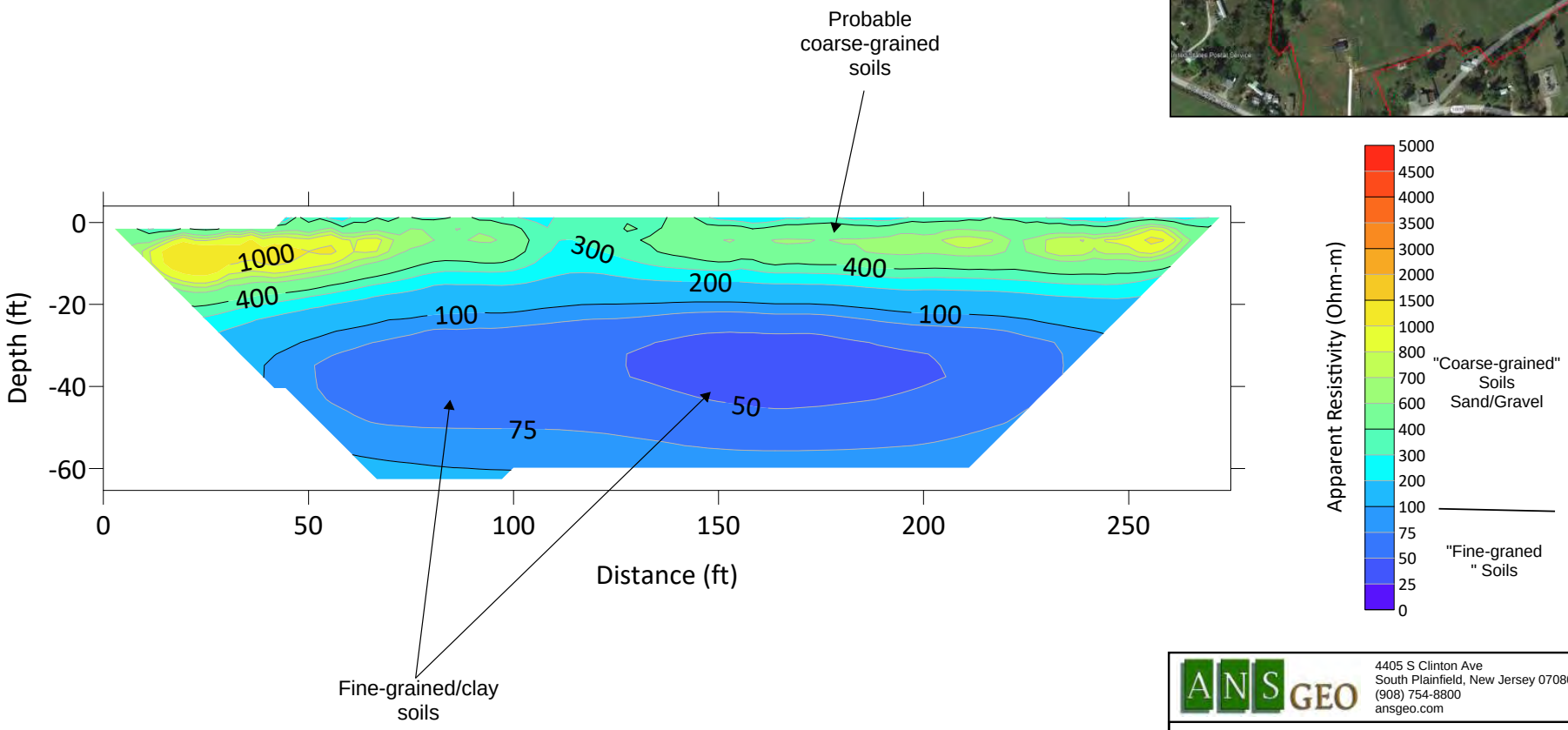
Absolute Scale: 1 inch = 900 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Chris Hughes
Date: July 20, 2022
Drawing Number: ILP-1 Rev.0

Attachment B

Electrical Resistivity Imaging Profiles





Notes:

Geophysical survey conducted June 16, 2022 using AGI's Supersting R8 Resistivity continuous vertical electrical sounder with 5 foot spacings and 56 Electrode spacings. Data was interpreted using EarthImager 2D Inversion software.

No vertical exaggeration.

Real-time positioning of data using fully integrated Trimble Geo-7x global positioning system set to NAD 1983 Kentucky State coordinate system (US Survey feet).

Locations are approximate.

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ansgeo.com

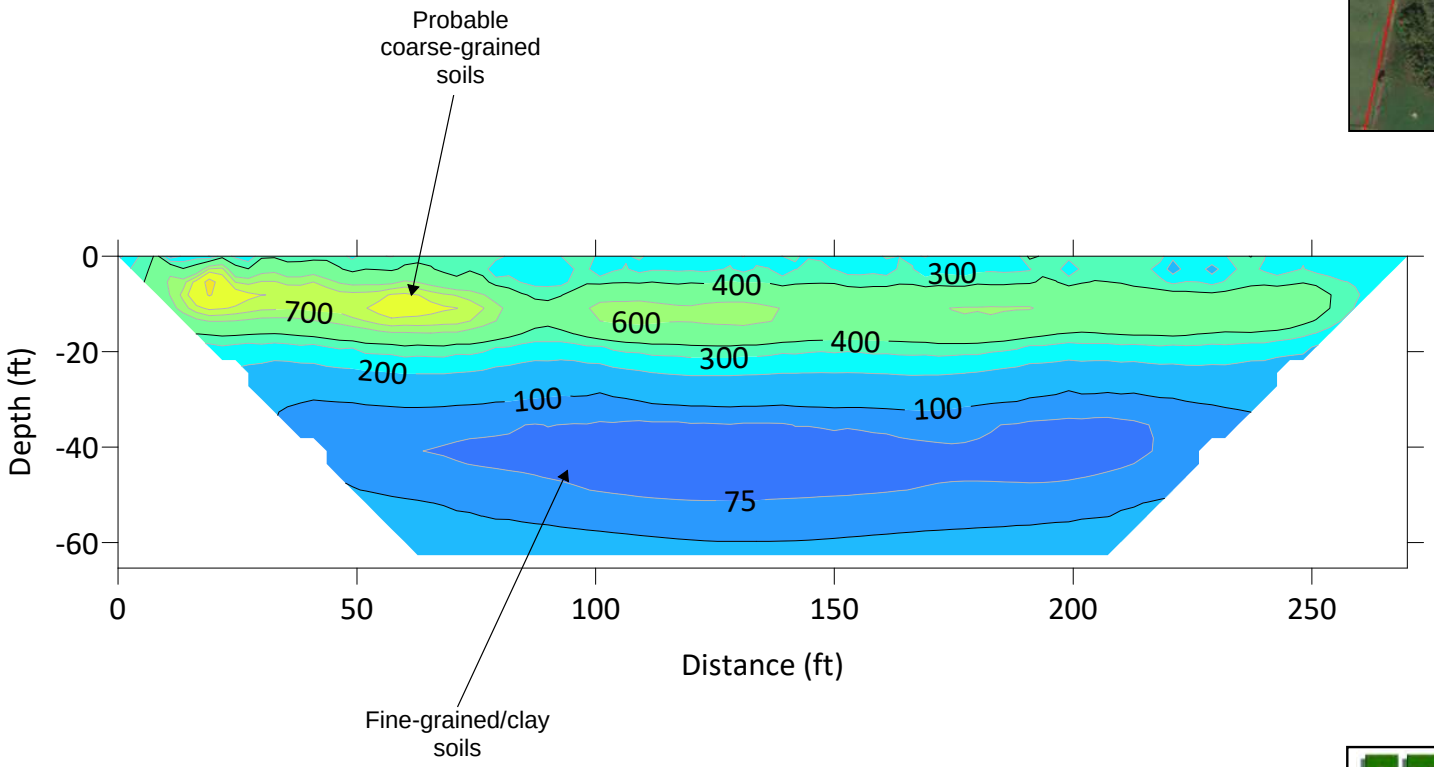
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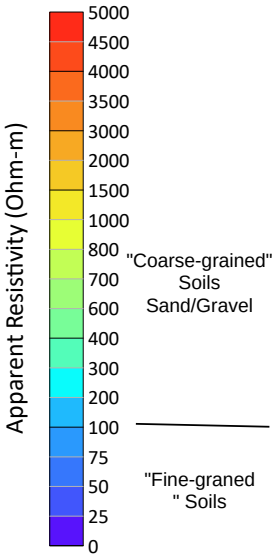
Geophysical Investigation
Barrelhead Solar Project
Happy Top, Kentucky

Drawing No.: Figure 1
Electrical Resistivity Imaging Profile
Location 1 (ERI-1)

Prepared For: PINEGATE RENEWABLES







Notes:

Geophysical survey conducted June 17, 2022 using AGI's Supersting R8 Resistivity continuous vertical electrical sounder with 10 foot spacings and 28 Electrode spacings. Data was interpreted using EarthImager 2D Inversion software.

No vertical exaggeration.

Real-time positioning of data using fully integrated Trimble Geo-7x global positioning system set to NAD 1983 Kentucky State coordinate system (US Survey feet).

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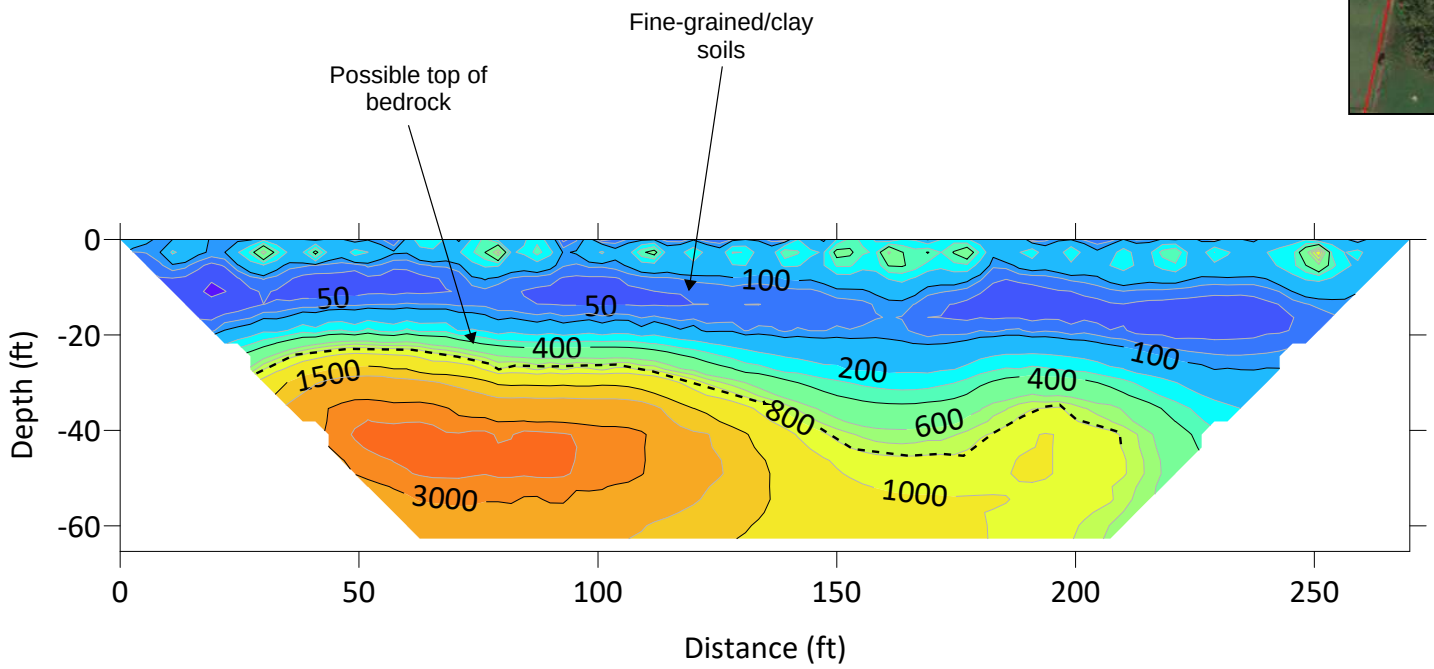
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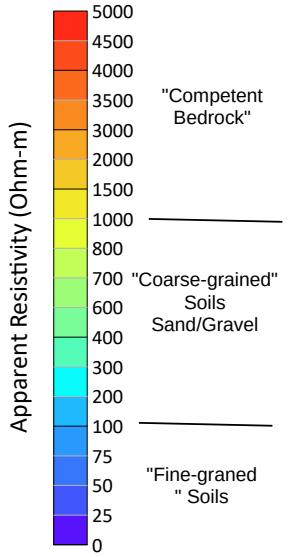
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Drawing No.: Figure 2
Electrical Resistivity Imaging Profile
Location 2 (ERI-2)

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Notes:

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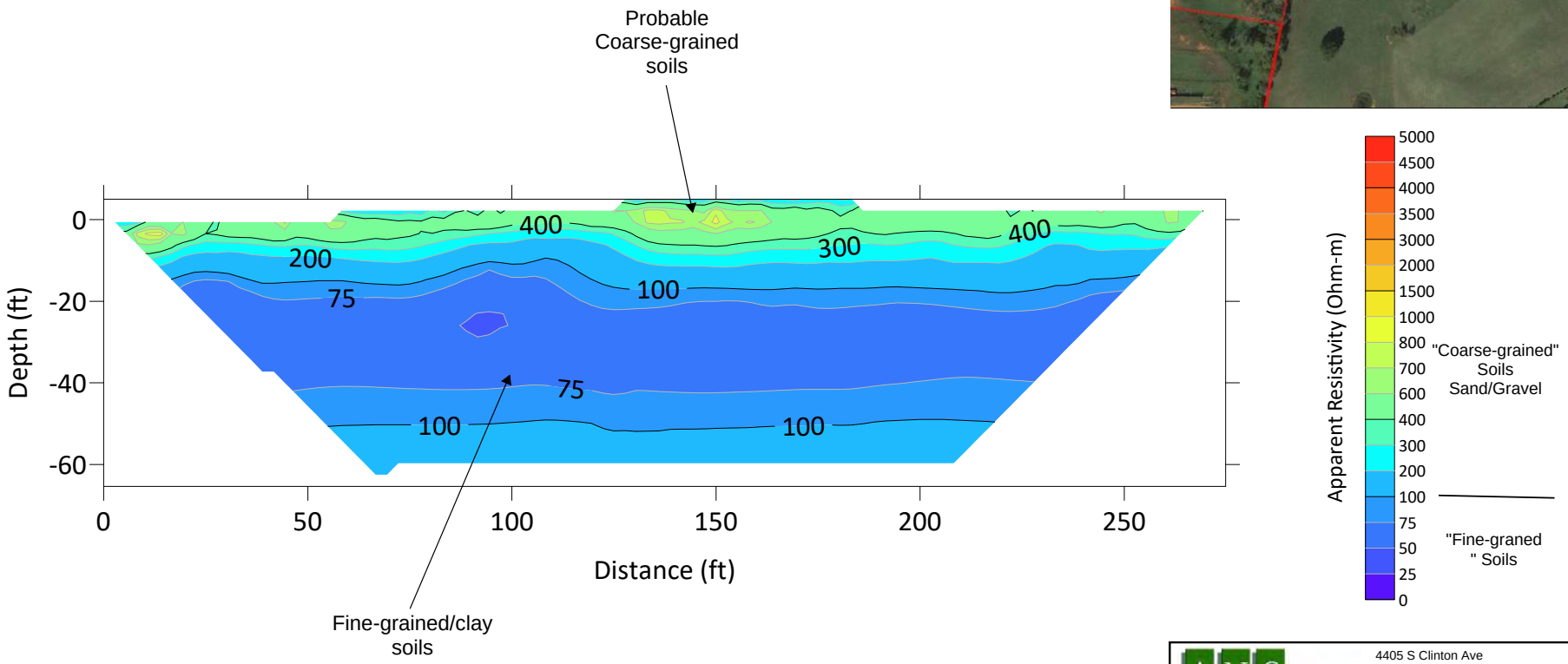
Project:

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Happy Top, Kentucky

Drawing No.: Figure 3
Electrical Resistivity Imaging Profile
Location 3 (ERI-3)

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Notes:

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No vertical exaggeration.

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Locations are approximate.

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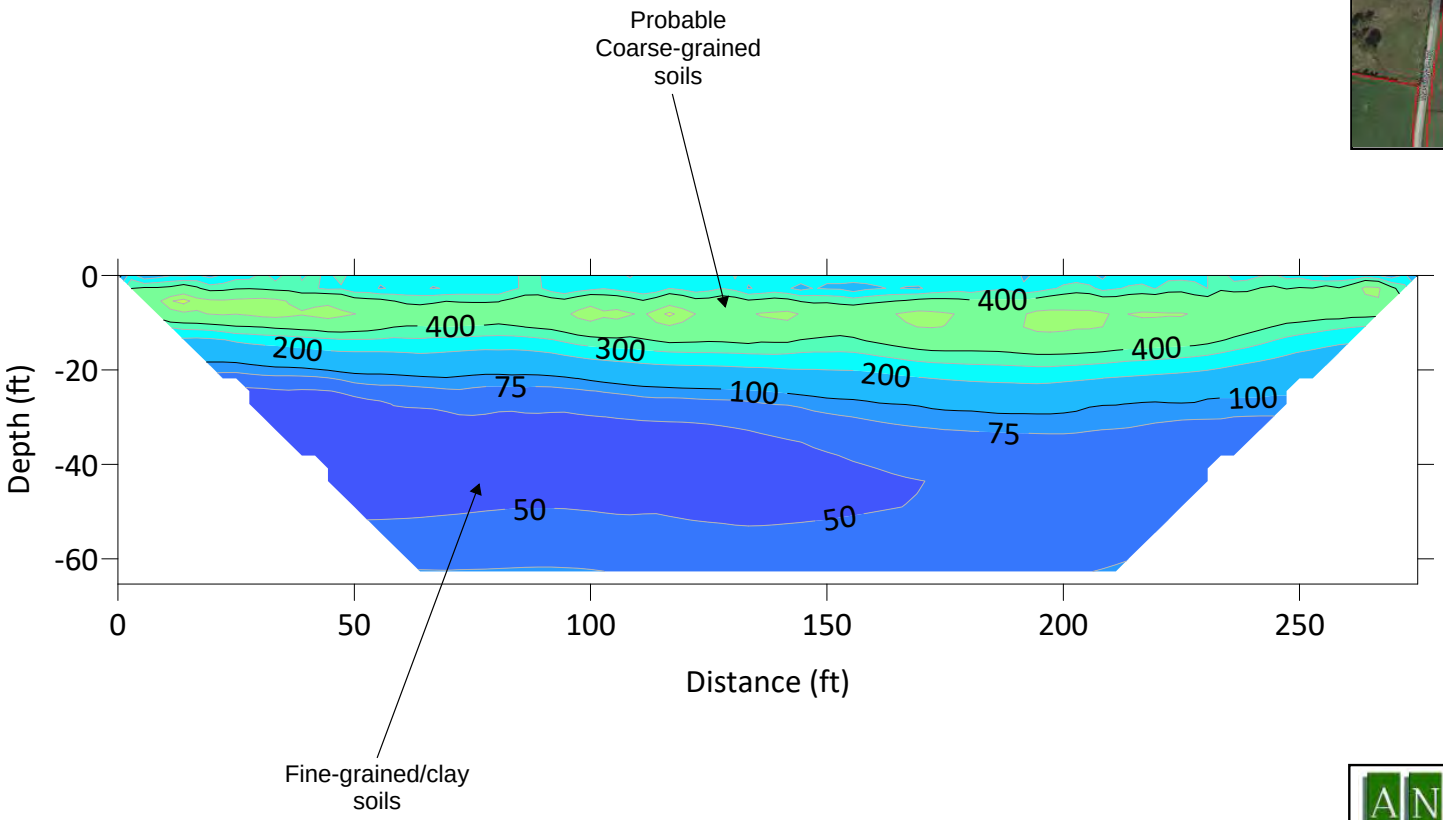
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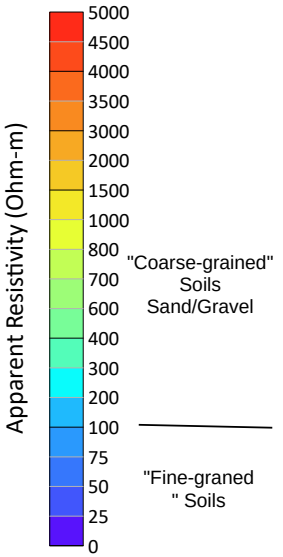
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Drawing No.: Figure 4
Electrical Resistivity Imaging Profile
Location 4 (ERI-4)

Prepared For: PINEGATE RENEWABLES







Notes:

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No vertical exaggeration.

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Locations are approximate.

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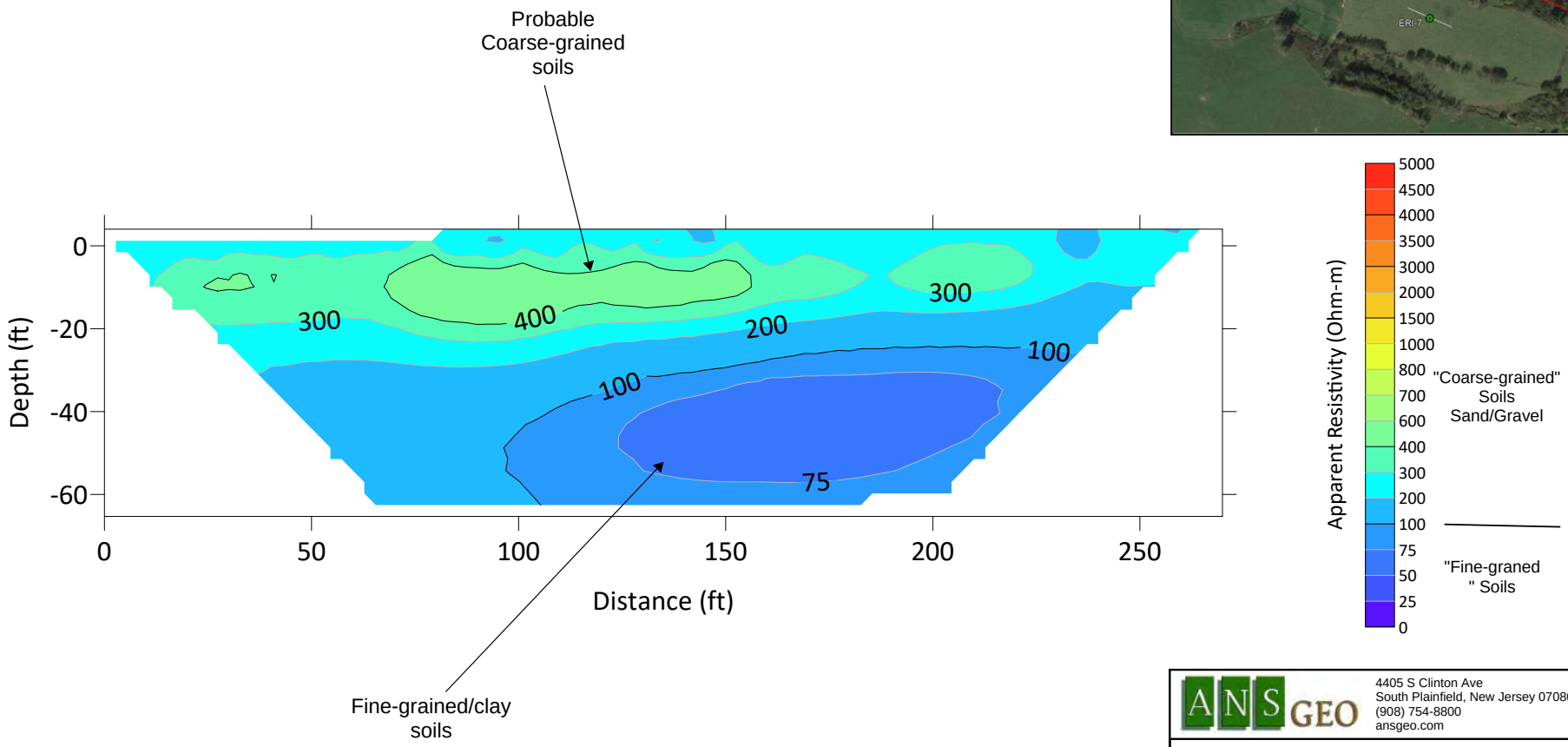
Project:

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Barrelhead Solar Project
Happy Top, Kentucky

Drawing No.: Figure 5
Electrical Resistivity Imaging Profile
Location 5 (ERI-5)

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Notes:

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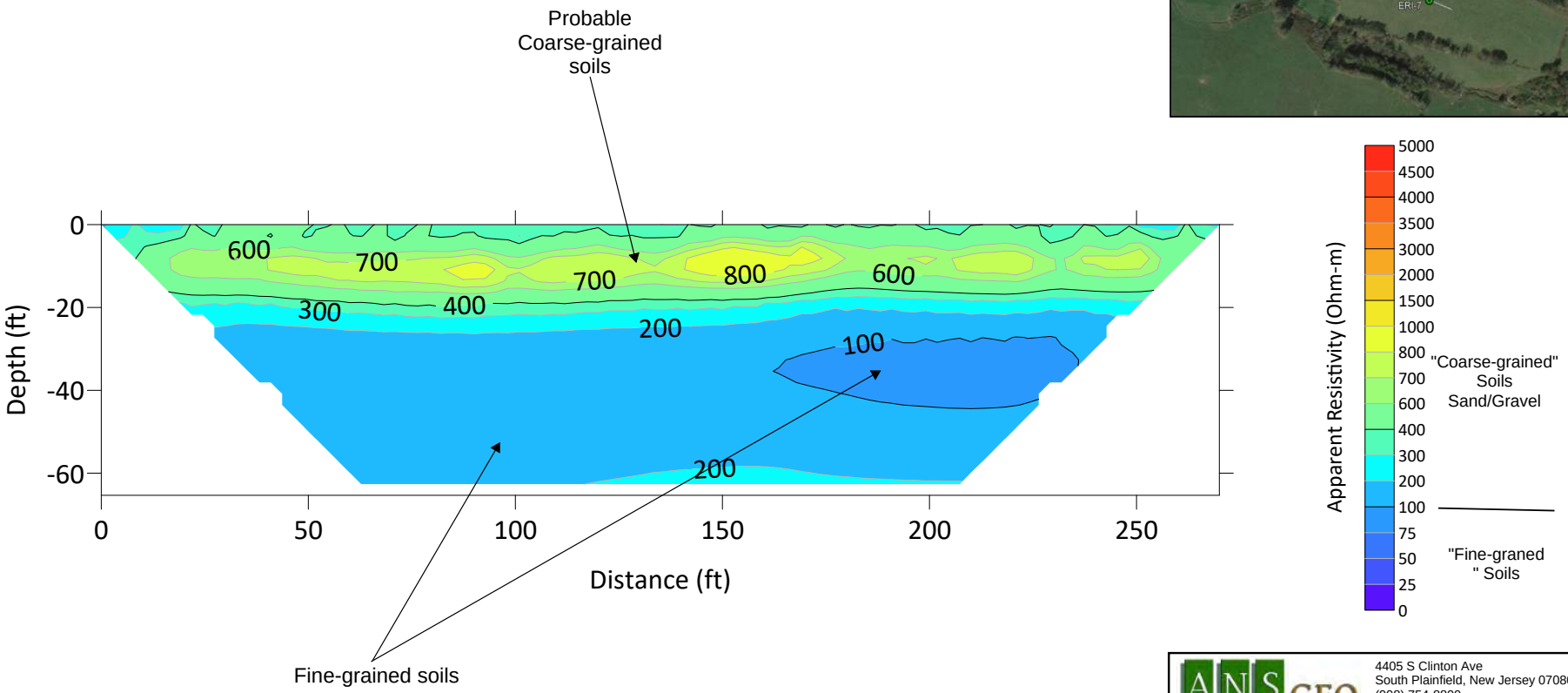
Project:

Geophysical Investigation
Barrelhead Solar Project
Happy Top, Kentucky

Drawing No.: Figure 6
Electrical Resistivity Imaging Profile
Location 6 (ERI-6)

Prepared For: PINEGATE RENEWABLES





Notes:

Geophysical survey conducted June 19, 2022 using AGI's Supersting R8 Resistivity continuous vertical electrical sounder with 10 foot spacings and 28 Electrode spacings. Data was interpreted using EarthImager 2D Inversion software.

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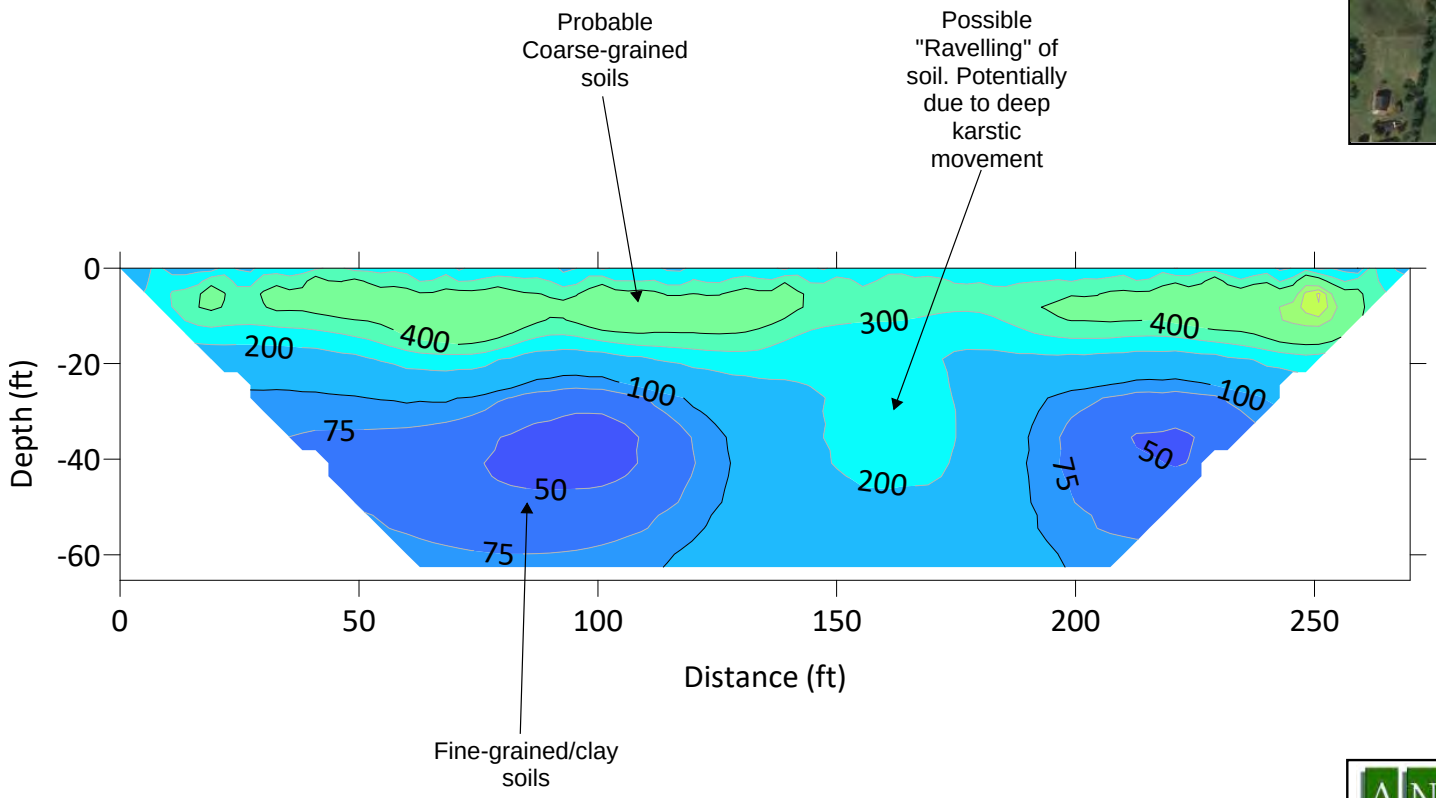
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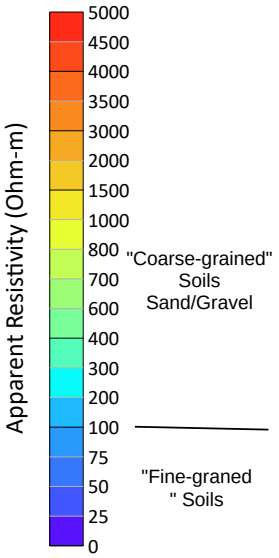
Geophysical Investigation
Barrelhead Solar Project
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Drawing No.: Figure 7
Electrical Resistivity Imaging Profile
Location 7 (ERI-7)

Prepared For: PINEGATE RENEWABLES







Notes:

Geophysical survey conducted June 19, 2022 using AGI's Supersting R8 Resistivity continuous vertical electrical sounder with 10 foot spacings and 28 Electrode spacings. Data was interpreted using EarthImager 2D Inversion software.

No vertical exaggeration.

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Locations are approximate.

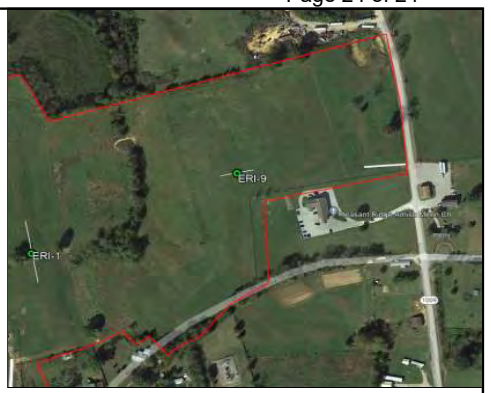
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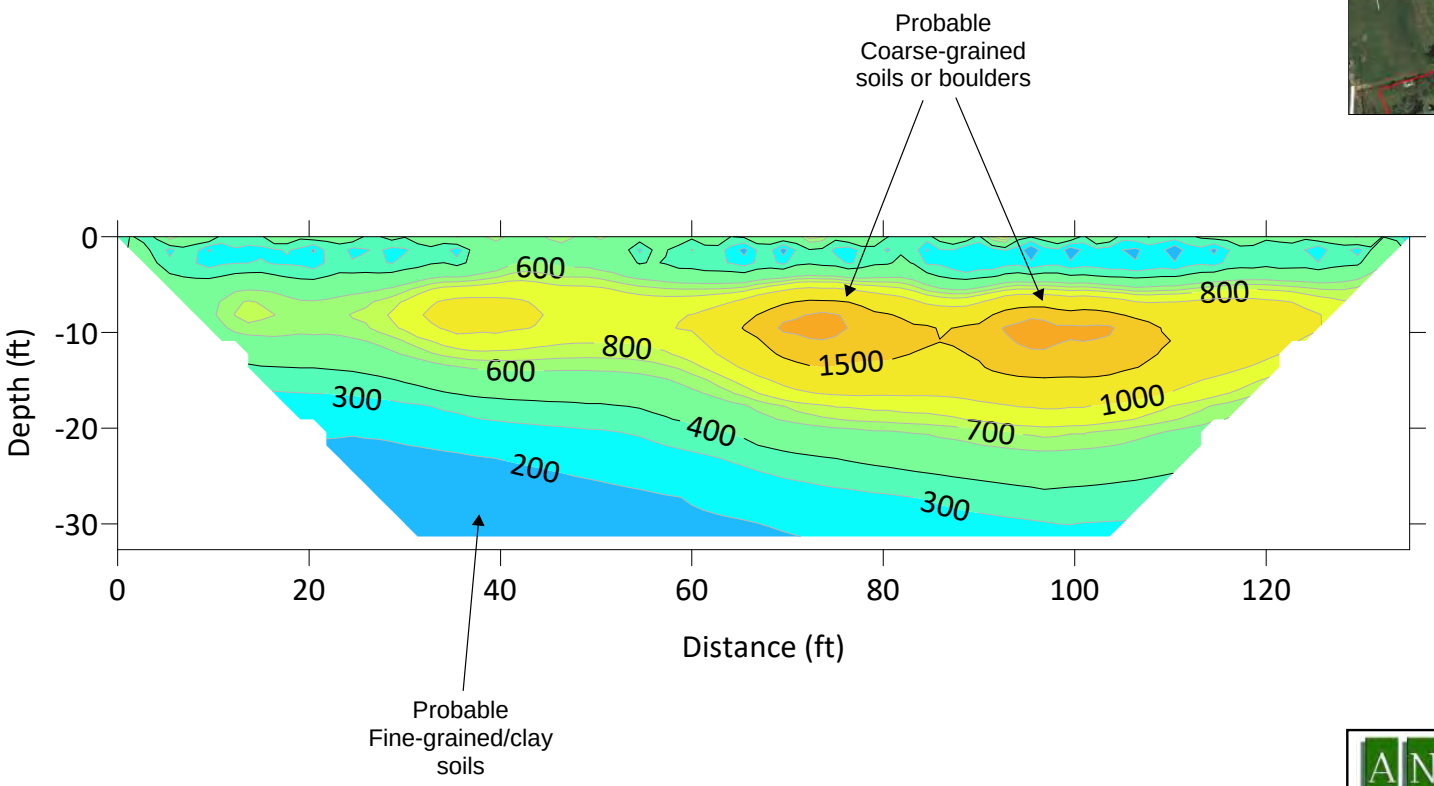
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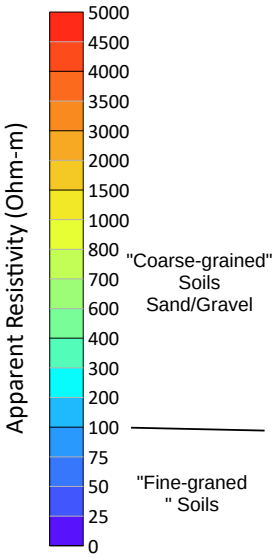
Geophysical Investigation
Barrelhead Solar Project
Happy Top, Kentucky

Drawing No.: Figure 8
Electrical Resistivity Imaging Profile
Location 8 (ERI-8)

Prepared For: PINEGATE RENEWABLES







Notes:

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Locations are approximate.

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Project:

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Barrelhead Solar Project
Happy Top, Kentucky

Drawing No.: Figure 9
Electrical Resistivity Imaging Profile
Location 9 (ERI-9)

Prepared For: PINEGATE RENEWABLES

Siting Board 1-93:

Provide a parcel map, identifying individual parcels within the Project boundary, owner name, and acreage.

Response: See response to RFI 1-7.

Witness: Marty Marchaterre

Siting Board 1-94:

Explain whether there will be vegetation clearing for construction. Provide in the response the number of acres that will be cleared and any permits that will be required.

Response: Yes, the Project will need to clear vegetation for construction. Approximately 13.51 acres of trees would be cleared. A figure has been developed and is included as Attachment 1-95.

As part of the Section 7 of the Endangered Species Act consultation process, tree clearing and its potential effect on threatened and endangered bat species would be determined with the United States Fish and Wildlife Service. This consultation process would be part of the United States Army Corps of Engineers Section 404 of the Clean Water Act permitting process.

No state permit is anticipated to be needed for Project tree or vegetation clearing.

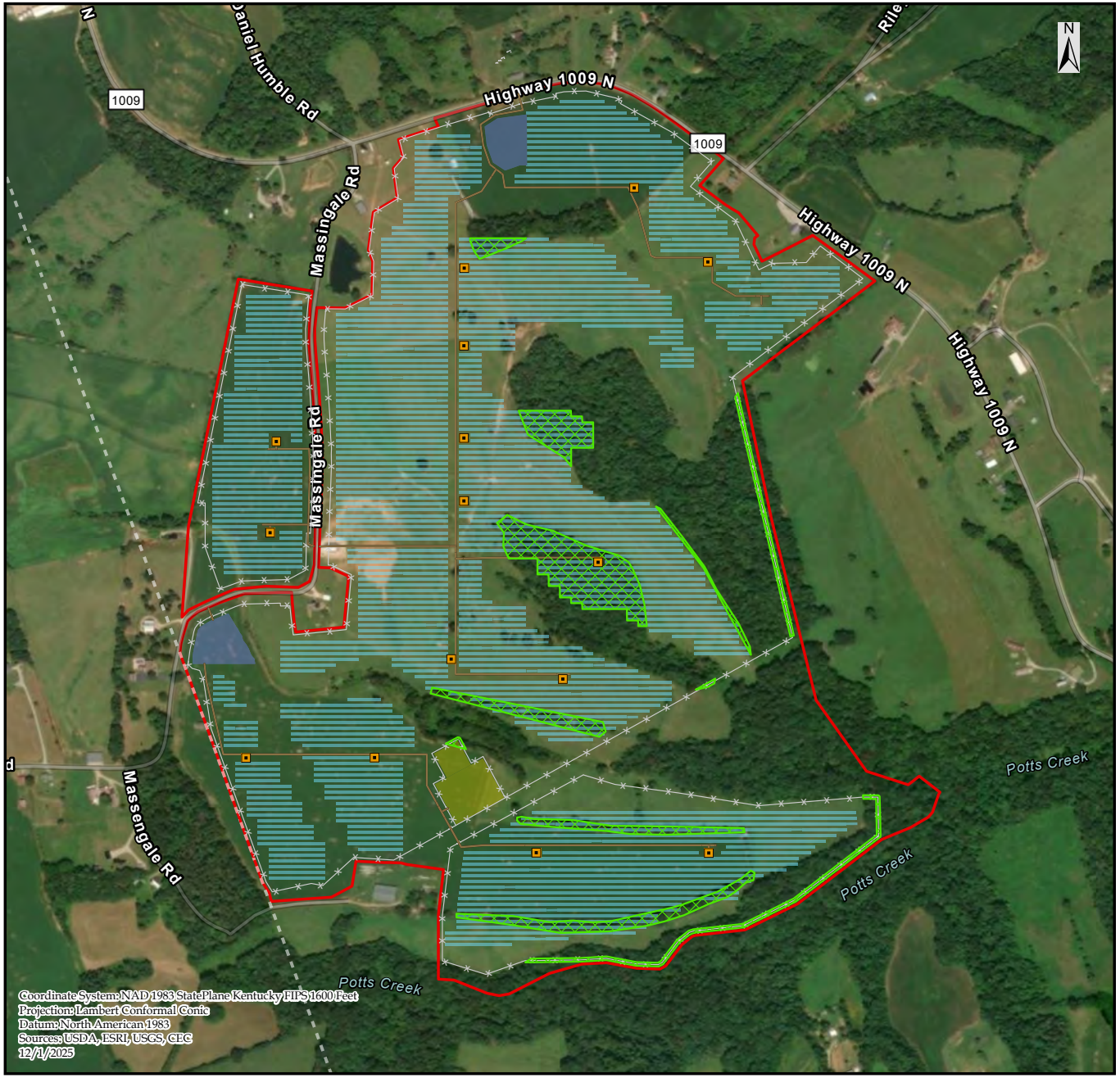
Witness: Marty Marchaterre

Siting Board 1-95:

Provide a map showing all proposed areas of vegetative clearing within the project site.

Response: See Attachment 1-95.

Witness: Marty Marchaterre



COPPERHEAD
ENVIRONMENTAL CONSULTING

Prepared for:

Barrelhead Solar, LLC

FIGURE 1-95:
Vegetation Clearing for the
Barrelhead Solar Project,
Wayne County, Kentucky.

Legend

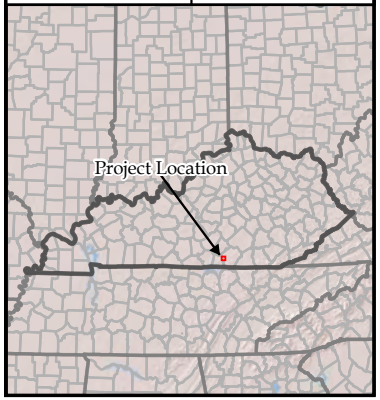
- Inverter
- Fence
- Road
- Vegetation Clearing
- Solar Array
- Substation
- Laydown Area
- Project Boundary

0 — 750 — 1,500
US Feet

Scale: 1 in = 750 ft

Prepared by :
Copperhead Environmental Consulting, Inc.
471 Main Street
P.O. Box 73
Paint Lick, Kentucky 40461

Drawn by:	CM	Date:	12/1/2025
Checked by:	MM	Revision:	02



Siting Board 1-96:

Provide how many miles of vegetative screening will be included in the project.

Response: Barrelhead Solar anticipates providing approximately 1.88 miles of vegetative screening for the Project (see SAR, Appendix F: Landscape Plan).

Witness: Marty Marchaterre

Siting Board 1-97:

Refer to SAR at 2. Explain why Barrelhead Solar selected a site despite 62.5 percent of adjoining parcels being residential.

Response: The Project's location is similar to the rural areas in which most similarly sized solar-generating facilities are located or proposed to be located. It was selected due to market demand, buildability of the land, proximity to existing transmission line infrastructure, and the willingness of the landowner to lease land to the Project. The Project has been thoughtfully designed to provide buffer from residences, with the natural topography and existing vegetation providing additional screening from adjoining residences.

Witness: Trudie Grattan

Siting Board 1-98:

Provide any communication representatives of Barrelhead Solar have had with any of the property owners surrounding the project. Explain whether any changes have been made to the project based upon those concerns.

Response: Barrelhead Solar has engaged in various conversations with surrounding property owners regarding the project. No surrounding property owners have expressed concerns to date.

Witness: Trudie Grattan

Siting Board 1-99:

Provide any communication with the Kentucky Transportation Cabinet District Engineer regarding permits or agreements necessary for the Project. If no communication has been initiated, explain when that contact will occur.

Response: Coordination with the Kentucky Transportation Cabinet District Engineer or their representative will take place prior to construction. Barrelhead Solar has initiated outreach with KYTC District 8 regarding permits or agreements necessary for the Project.

Witness: Trudie Grattan

Siting Board 1-100:

Provide information on the specifications, model number, and cutsheets of the photovoltaic (PV) cell/solar panels to be used.

Response: The preliminary array design is based on using the CSI Solar Co. TOPBiHiKu7 N-type Bifacial TOPCon Technology PV panels. The cutsheet for this product, which provides additional specifications, is provided as Attachment 1-100.

One of the primary benefits of TOPCon technology is higher efficiency rates. TOPCon panels demonstrate better performance in low-light conditions compared to conventional modules. The advanced cell structure of TOPCon panels allows for more efficient energy conversion, even when sunlight is limited, such as during early mornings, late evenings, or overcast weather. This characteristic makes TOPCon an attractive option for regions with frequent cloud cover or shade patterns. TOPCon modules also boast an improved temperature coefficient, meaning their efficiency degrades less as temperatures rise. This results in better energy production during hot summer months when traditional panels experience more significant output losses due to heat. Furthermore, TOPCon cells exhibit a lower annual degradation rate, ensuring more consistent long-term performance over the system's lifetime. Another key advantage of TOPCon technology is its higher bifacial gain. These panels can generate substantial energy from light hitting both the front and rear surfaces, increasing overall energy yield compared to monofacial modules.

Barrelhead Solar reserves the right to utilize another supplier that offers similar technology and performance.

Witness: Trudie Grattan

CanadianSolar

TOPBiHiKu7

N-type Bifacial TOPCon Technology

690 W ~ 720 W

CS7N-690|695|700|705|710|715|720TB-AG



MORE POWER

- 720 W — Module power up to 720 W
  Module efficiency up to 23.2 %
- EXTRA POWER — Up to 85% Power Bifaciality,
  more power from the back side
- Excellent anti-LeTID & anti-PID performance.
  Low power degradation, high energy yield
- Lower temperature coefficient (Pmax): -0.29%/°C,
  increases energy yield in hot climate
- Lower LCOE & system cost

MORE RELIABLE

- Tested up to ice ball of 35 mm diameter
  according to IEC 61215 standard
- Minimizes micro-crack impacts
- Heavy snow load up to 5400 Pa,
  wind load up to 2400 Pa*

12 Years **Enhanced Product Warranty on Materials and Workmanship***

30 Years **Linear Power Performance Warranty***

1st year power degradation no more than 1%
Subsequent annual power degradation no more than 0.4%

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001: 2015 / Quality management system
ISO 14001: 2015 / Standards for environmental management system
ISO 45001: 2018 / International standards for occupational health & safety
IEC 62941: 2019 / Photovoltaic module manufacturing quality system

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730 / CE / INMETRO / MCS / UKCA / CGC
CEC listed (US California) / FSEC (US Florida)
UL 61730 / IEC 61701 / IEC 62716 / IEC 60068-2-68
UNI 9177 Reaction to Fire: Class 1 / Take-e-way

* The specific certificates applicable to different module types and markets will vary, and therefore not all of the certifications listed herein will simultaneously apply to the products you order or use. Please contact your local Canadian Solar sales representative to confirm the specific certificates available for your Product and applicable in the regions in which the products will be used.

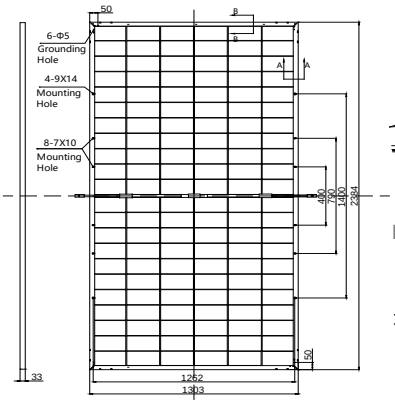
CSI Solar Co., Ltd. is committed to providing high quality solar photovoltaic modules, solar energy and battery storage solutions to customers. The company was recognized as the No. 1 module supplier for quality and performance/price ratio in the IHS Module Customer Insight Survey. Over the past 23 years, it has successfully delivered over 125 GW of premium-quality solar modules across the world.

* For detailed information, please refer to the Installation Manual.

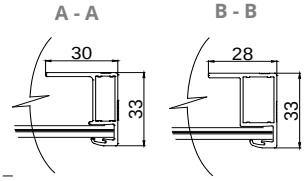
CSI Solar Co., Ltd.
199 Lushan Road, SND, Suzhou, Jiangsu, China, 215129, www.csisolar.com, support@csisolar.com

ENGINEERING DRAWING (mm)

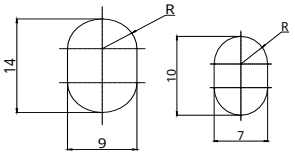
Rear View



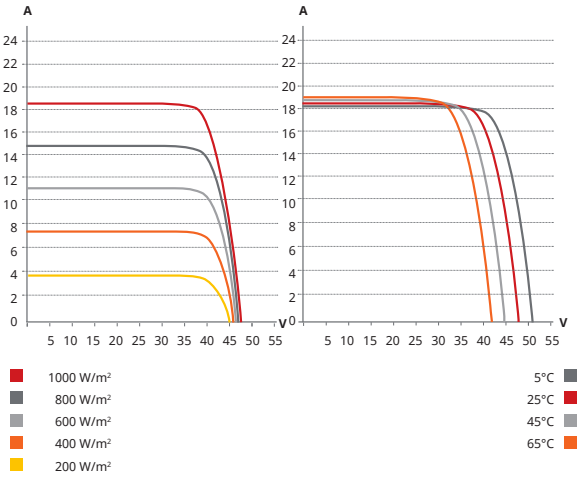
Frame Cross Section



Mounting Hole



CS7N-695TB-AG / I-V CURVES



ELECTRICAL DATA | STC*

		Nominal Max. Power (Pmax)	Opt. Operating Voltage (Vmp)	Opt. Operating Current (Imp)	Open Circuit Voltage (Voc)	Short Circuit Current (Isc)	Module Efficiency
CS7N-690TB-AG		690 W	39.6 V	17.43 A	47.5 V	18.39 A	22.2%
Bifacial Gain**	5%	725 W	39.6 V	18.30 A	47.5 V	19.31 A	23.3%
	10%	759 W	39.6 V	19.17 A	47.5 V	20.23 A	24.4%
	20%	828 W	39.6 V	20.92 A	47.5 V	22.07 A	26.7%
CS7N-695TB-AG		695 W	39.8 V	17.47 A	47.7 V	18.44 A	22.4%
Bifacial Gain**	5%	730 W	39.8 V	18.34 A	47.7 V	19.36 A	23.5%
	10%	765 W	39.8 V	19.22 A	47.7 V	20.28 A	24.6%
	20%	834 W	39.8 V	20.96 A	47.7 V	22.13 A	26.8%
CS7N-700TB-AG		700 W	40.0 V	17.51 A	47.9 V	18.49 A	22.5%
Bifacial Gain**	5%	735 W	40.0 V	18.39 A	47.9 V	19.41 A	23.7%
	10%	770 W	40.0 V	19.26 A	47.9 V	20.34 A	24.8%
	20%	840 W	40.0 V	21.01 A	47.9 V	22.19 A	27.0%
CS7N-705TB-AG		705 W	40.2 V	17.55 A	48.1 V	18.54 A	22.7%
Bifacial Gain**	5%	740 W	40.2 V	18.43 A	48.1 V	19.47 A	23.8%
	10%	776 W	40.2 V	19.31 A	48.1 V	20.39 A	25.0%
	20%	846 W	40.2 V	21.06 A	48.1 V	22.25 A	27.2%
CS7N-710TB-AG		710 W	40.4 V	17.59 A	48.3 V	18.59 A	22.9%
Bifacial Gain**	5%	746 W	40.4 V	18.47 A	48.3 V	19.52 A	24.0%
	10%	781 W	40.4 V	19.35 A	48.3 V	20.45 A	25.1%
	20%	852 W	40.4 V	21.11 A	48.3 V	22.31 A	27.4%
CS7N-715TB-AG		715 W	40.6 V	17.63 A	48.5 V	18.64 A	23.0%
Bifacial Gain**	5%	751 W	40.6 V	18.51 A	48.5 V	19.57 A	24.2%
	10%	787 W	40.6 V	19.39 A	48.5 V	20.50 A	25.3%
	20%	858 W	40.6 V	21.16 A	48.5 V	22.37 A	27.6%
CS7N-720TB-AG		720 W	40.8 V	17.67 A	48.7 V	18.69 A	23.2%
Bifacial Gain**	5%	756 W	40.8 V	18.55 A	48.7 V	19.62 A	24.3%
	10%	792 W	40.8 V	19.44 A	48.7 V	20.56 A	25.5%
	20%	864 W	40.8 V	21.20 A	48.7 V	22.43 A	27.8%

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.
** Bifacial Gain: The additional gain from the back side compared to the power of the front side at the standard test condition. It depends on mounting (structure, height, tilt angle etc.) and albedo of the ground.

ELECTRICAL DATA | NMOT*

	Nominal Max. Power (Pmax)	Opt. Operating Voltage (Vmp)	Opt. Operating Current (Imp)	Open Circuit Voltage (Voc)	Short Circuit Current (Isc)
CS7N-690TB-AG	522 W	37.4 V	13.94 A	45.0 V	14.83 A
CS7N-695TB-AG	526 W	37.6 V	13.97 A	45.2 V	14.87 A
CS7N-700TB-AG	529 W	37.8 V	14.00 A	45.4 V	14.91 A
CS7N-705TB-AG	533 W	38.0 V	14.03 A	45.5 V	14.95 A
CS7N-710TB-AG	537 W	38.2 V	14.06 A	45.7 V	14.99 A
CS7N-715TB-AG	541 W	38.4 V	14.09 A	45.9 V	15.03 A
CS7N-720TB-AG	544 W	38.6 V	14.12 A	46.1 V	15.07 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m² spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

Specification	Data
Cell Type	TOPCon cells
Cell Arrangement	132 [2 x (11 x 6)]
Dimensions	2384 × 1303 × 33 mm (93.9 × 51.3 × 1.30 in)
Weight	37.8 kg (83.3 lbs)
Front Glass	2.0 mm heat strengthened glass with anti-reflective coating
Back Glass	2.0 mm heat strengthened glass
Frame	Anodized aluminium alloy
J-Box	IP68, 3 bypass diodes
Cable	4.0 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	360 mm (14.2 in) (+) / 200 mm (7.9 in) (-) or customized length*
Connector	T6 or MC4-EVO2 or MC4-EVO2A
Per Pallet	33 pieces
Per Container (40' HQ)	594 pieces or 495 pieces (only for US & Canada)

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

ELECTRICAL DATA

Operating Temperature	-40°C ~ +85°C
Max. System Voltage	1500 V (IEC/UL)
Module Fire Performance	TYPE 29 (UL 61730) or CLASS C (IEC61730)
Max. Series Fuse Rating	35 A
Protection Class	Class II
Power Tolerance	0 ~ + 10 W
Power Bifaciality*	80 %

* Power Bifaciality = $Pmax_{rear}$ / $Pmax_{front}$, both $Pmax_{rear}$ and $Pmax_{front}$ are tested under STC, Bifaciality Tolerance: ± 5 %

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.29 % / °C
Temperature Coefficient (Voc)	-0.25 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	41 ± 3°C

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. CSI Solar Co., Ltd. reserves the right to make necessary adjustment to the information described herein at any time without further notice.
Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

PARTNER SECTION

CSI Solar Co., Ltd.
199 Lushan Road, SND, Suzhou, Jiangsu, China, 215129, www.csisolar.com, support@csisolar.com

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Siting Board 1-101

Provide a net decommissioning cost that accounts for the costs and potential salvage value of the substation and transmission line.

Response: While the substation and transmission line are not required to be considered in the decommission plan as the interconnection can be left in place (KRS 278.706(2)(m)(4)), the potential project substation decommissioning costs have been identified below:

- Removal of substation with one transformer. (At this time, Barrelhead Solar assumes one transformer due to the size of the project. Decommissioning costs for one transformer are estimated at $330,000. If during final design, the Project needs two transformers, the decommissioning costs would be approximately $495,000.

Project substation potential revenue:

- Project substation typically has a power transformer(s), an electrical control house, gravel pads and concrete foundations. The items typically included as potential salvage revenue consist of any steel from the control house as well as the transformer itself. Barrelhead Solar assumes one transformer and therefore the potential salvage revenue for the substation would be approximately $50,000. With two transformers, the estimated salvage revenue would be approximately $75,000.

Project transmission line decommissioning cost:

In the decommissioning plan, it was assumed approximately 0.65 linear mile of overhead transmission line. Based on the revised site design plan, the interconnection/transmission line may only be approximately 100 – 150 feet in length. Therefore, the estimated removal cost for 150 feet or 0.03 linear mile would be approximately $6,300. With what was measured on the original site plan of 0.65 linear miles, the removal cost could be up to $135,850.

Project transmission line potential revenue:

Transmission lines are comprised of the overhead line itself and the kV rating, electrical conductors, insulators and crossarms, and the steel poles supporting the line. Revenues are based on the steel from the line and poles as well as the number and type of conductors. Stantec does not have enough technical information at this time to provide a potential revenue for the transmission line.

Witness: Marty Marchaterre

Siting Board 1-102:

Provide any materials submitted to other permitting agencies related to this Project.

Response: No other materials have been submitted to other permitting agencies related to this Project at this time.

Witness: Marty Marchaterre

Siting Board 1-103:

Provide a list of all permits required from other local, state ,or federal agencies for the construction and operation of the Project, indicating the specific agency, permit type and applicability to the Project.

Response: See response to RFI 1-83.

Witness: Marty Marchaterre

Siting Board 1-104:

Refer to the Application, Appendix J, Decommissioning Plan, Section 2.6. Explain whether the landowner has requested that the substation and transmission line be removed during decommissioning.

Response: At this time, the Landowner has not requested the substation and transmission line be removed during decommissioning.

Witness: Trudie Grattan

Siting Board 1-105:

Refer to the Application, Appendix J, Decommissioning Plan, Section 4. Confirm that the estimated decommissioning costs and revenues do not include removal of the substation and transmission line.

Response: Refer to the Application, Appendix J, Decommissioning Plan, Section 2.6. The decommissioning costs and revenues do not include the removal of the Project substation or transmission line as those are considered "interconnection and other facilities" described in 2023 KRS 278.706.

Witness: Marty Marchaterre

Siting Board 1-106:

Provide a net decommissioning cost that accounts for the costs and potential salvage value of the substation and transmission line.

Response: See response to RFI 1-101.

Witness: Marty Marchaterre

COMMONWEALTH OF KENTUCKY
BEFORE THE KENTUCKY STATE BOARD
ON ELECTRIC GENERATION AND TRANSMISSION SITING

In the Matter of the Application of Barrelhead Solar, LLC for a Certificate of Construction for an approximately 54-Megawatt Merchant Electric Generating Facility in Wayne County, Kentucky pursuant to KRS 278.700, et seq., and 807 KAR 4:110	)))	**Case No. 2025-00177**

CERTIFICATION

This is to certify that I have supervised the preparation of Barrelhead Solar, LLC's responses to the Siting Board Staff's First Request for Information and that the responses on which I am identified as a sponsoring witness are true and accurate to the best of my knowledge, information, and belief after reasonable inquiry.

12/1/25
Date

Marty Marchaterre
Marty Marchaterre

COMMONWEALTH OF KENTUCKY
BEFORE THE KENTUCKY STATE BOARD
ON ELECTRIC GENERATION AND TRANSMISSION SITING

In the Matter of the Application of Barrelhead Solar, LLC for a Certificate of Construction for an approximately 54-Megawatt Merchant Electric Generating Facility in Wayne County, Kentucky pursuant to KRS 278.700, et seq., and 807 KAR 4:110	)))	**Case No. 2025-00177**

CERTIFICATION

This is to certify that I have supervised the preparation of Barrelhead Solar, LLC's responses to the Siting Board Staff's First Request for Information and that the responses on which I am identified as a sponsoring witness are true and accurate to the best of my knowledge, information, and belief after reasonable inquiry.

12/1/2025
Date

Joshua C. Pinkston
Joshua Pinkston

COMMONWEALTH OF KENTUCKY
BEFORE THE KENTUCKY STATE BOARD
ON ELECTRIC GENERATION AND TRANSMISSION SITING

In the Matter of the Application of Barrelhead Solar, LLC for a Certificate of Construction for an approximately 54-Megawatt Merchant Electric Generating Facility in Wayne County, Kentucky pursuant to KRS 278.700, et seq., and 807 KAR 4:110	**)** **)** **)**	**Case No. 2025-00177**

CERTIFICATION

This is to certify that I have supervised the preparation of Barrelhead Solar, LLC's responses to the Siting Board Staff's First Request for Information and that the responses on which I am identified as a sponsoring witness are true and accurate to the best of my knowledge, information, and belief after reasonable inquiry.

12/1/2025

Signed by:
Trudie Grattan
C0283142D8E64E3...

Date

Trudie Grattan